

INVITATION FOR BIDS



BID TITLE: HVAC-D.G.COOLEY ELEMENTARY-LOWER CAMPUS

BID NUMBER: IFB #16-0525

BID DUE DATE: MAY 25, 2016

BID DUE TIME: 3:00 P.M.

A mandatory pre-bid meeting will be held at the front main entrance of D.G. Cooley Elementary School-Lower Campus on May 11, 2016 at 1:00 p.m. The Elementary School is located at 240 Westwood Road, Berryville, VA 22611. Vendors will be allowed to inspect the existing HVAC system and ask questions. Only those vendors with a representative signing in before the conclusion of the meeting will be eligible to submit a bid.

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*Three drawings also part of this IFB are posted on the County website, [www.clarkecounty](http://www.clarkecounty.gov), gov. under business and current solicitations.

I. Invitation for Bids (as publicly advertised)

PUBLIC NOTICE
IFB #16-0525
HVAC-D.G. COOLEY ELEMENTARY-LOWER CAMPUS

The Clarke County Purchasing Office, on behalf of the Clarke County Joint Maintenance Department, is soliciting competitive sealed bids from qualified vendors that are qualified and capable of providing and installing a cooling tower replacement at D.G. Cooley Elementary School-Lower Campus, as specified in the IFB.

Sealed bids should be clearly marked, "IFB #16-0525 HVAC-D.G. Cooley Elementary School-Lower Campus." Bids must be received in the Clarke County Purchasing Office before 3:00 P.M. (local prevailing time), Wednesday, May 25, 2016, at which time they will be publicly opened and read aloud. Bids received after this time will not be accepted.

A mandatory pre-bid meeting will be held at the front main entrance of D.G. Cooley Elementary School-Lower Campus on May 11, 2016 at 1:00 p.m. The Elementary School is located at 240 Westwood Road, Berryville, VA 22611. Vendors will be allowed to inspect the existing HVAC system and ask questions. Only those vendors with a representative signing in before the conclusion of the meeting will be eligible to submit a bid.

Bid documents are available at Clarke County Purchasing Office, 129 Ramsburg Lane, Berryville, VA 22611, 540-955-5185, by email at mlegge@clarkecounty.gov, or on-line at www.clarkecounty.gov and www.clarke.k12.va.us.

Each vendor must be an Equal Opportunity Employer as defined by Federal and State Law.

Clarke County reserves the right to reject any and all proposals, to waive informalities, and to negotiate with the successful offeror(s).

Thomas J. Judge
Director of Joint Administrative Services

II. Special Terms and Conditions

A. Introduction

1. The intent of this “Invitation for Bids” (hereinafter known as “this document” and the resulting contract is to obtain the services of a qualified Contractor (hereinafter known as “Contractor”) to provide and install a cooling tower replacement for D.G. Cooley Elementary School-Lower Campus, as specified in this IFB.

2. All work performed under this contract shall be performed in accordance with all provisions of these specifications or plans and must be approved in writing by Clarke County or an authorized representative.

3. Any contract resulting from this solicitation shall be governed in any respects by the laws of Virginia, and any litigation with respect thereto shall be brought in the courts of the Commonwealth. The Contract shall comply with all applicable federal, state and local laws and regulations.

B. Tentative Time Frame

BID ADVERTISED	May 2, 2016
MANDATORY PRE-BID MEETING	A mandatory pre-bid meeting will be held at the front main entrance of D.G. Cooley Elementary School-Lower Campus on May 11, 2016 at 1:00 p.m. The Elementary School is located at 240 Westwood Road, Berryville, VA 22611. Vendors will be allowed to inspect the existing HVAC system and ask questions. Only those vendors with a representative signing in before the conclusion of the meeting will be eligible to submit a bid.
BID SUBMISSION DUE DATE	Must be received in the Clarke County Purchasing Office before 3:00 p.m. (local prevailing time) on Wednesday, May 25, 2016
AWARD OF CONTRACT	Estimated to be 1-2 weeks after bids are received.
CONTRACT BEGINS	The earliest the selected contractor can begin work is June 10, 2016.
CONTRACT ENDS	Clarke County Public Schools would like for the work to be completed by August 8, 2016.

Please note that the above dates are simply estimated time frames; Clarke County reserves the right to change dates as deemed necessary in the best interest of its constituents.

C. Addenda

1. Addenda may occur prior to bid opening. It is the vendor's responsibility to check the website (www.clarkecounty.gov) listing frequently to ensure that all solicitation information is complete and accurate. Upon award, this document in its entirety including any forms and addenda shall be referred to as the contract.
2. The County will attempt to notify all vendors that are known to have a complete set of Bid Documents; however, it is ultimately the responsibility of each company to check the County website (www.clarkecounty.gov, business, current solicitations) for addendums.
3. Copies of Addenda will be made available for inspection wherever Bid Documents are on file for that purpose.
4. No Addenda will be issued later than two (2) days prior to the date of receipt for Bids except:
 - a) any Addendum withdrawing the Invitation for Bids; or
 - b) any Addendum that includes postponement of the date of receipt for Bids.
5. Each Contractor should ascertain before submitting a Bid how many Addenda, if any, were issued.
6. Each Contractor should certify on the Response Form the number of additional addenda received.

D. Inclement weather: In the event that the Clarke County Purchasing Office is closed during the scheduled times for a pre-bid (pre-proposal) conference or bid opening; the pre-bid (pre-proposal) conference or bid opening will occur on the next business day that Clarke County Public School Administrative Offices are open at the appropriate times as stated in the IFB/RFP. Please check the County website, www.clarkecounty.gov, under business, and current solicitations for updates regarding any changes in meeting times and/or due dates.

E. Notice of Award

All Notices of Award and Notices of Intent to Award will be posted on the County website, www.clarkecounty.gov, under business, and current solicitations.

F. Reference Form, Attachment A

Each vendor should complete and submit Attachment A (Reference Form), with the names of most recent clients, preferably in Virginia, which can be verified as to the quality of service/work provided by the vendor.

G. Alternate Bids/Deviations

It is expected that each vendor should enter a bid only on the IFB as specified.

H. Use of Subcontractors

Clarke County reserves the right to reject the Contractor's selection of Subcontractors. Contractor should supply a list of all Subcontractors to Clarke County with bid documents. The County reserves the right to ask for references of subcontractors from bidders after the bids are opened, if deemed necessary.

I. Points of Contact

It is preferred that all questions be submitted in writing by emailing Mike Legge at mlegge@clarkecounty.gov. Please have all questions to Mr. Legge by May 18, 2016 to ensure that answers can be provided in a timely manner before the due date.

After the award is made, the Maintenance Director, will oversee the contract. Should you need to contact someone regarding this document, the following names are listed for your convenience. Please be sure to contact the person best suited to answer your questions or concerns.

NAME	TITLE	VOICE
Bobby Levi	Maintenance Director	(540) 955-5123
Ruby Miller	Maintenance Office Manager	(540) 955-5118
Randy Trenary	Director of Operations for CCPS	(540) 955-6105
Thomas J. Judge	Director of Joint Administrative Services	540-955-6172
Mike Legge	Purchasing Manager	540-955-5185
Emily Johnson	Accounts Payable Specialist	540-955-6171
Pat Wiley	Administrative Assistant-Purchasing	540-955-5148

Specific Reference to General Terms and Conditions

1. **A Bid Bond shall be required.** Each bidder shall accompany their bid with a bid bond or certified check in the amount of five percent (5%) of the amount bid. Such bond shall serve as liquidated damages and be forfeited in the event the successful bidder fails to enter into the contract.

If a bidder submits a bid without a bid bond, the bidder will be considered non-responsive and shall be disqualified.

2. **Payment and Performance Bonds shall be required.** The selected vendor shall be required to provide the County with a payment and performance bond, each in the amount equal to one-hundred percent (100%) of the contract as security for the faithful performance of this contract.

3. One or more surety companies authorized to do business in Virginia shall execute each of the bonds and the contract shall select the surety company. Required bonds shall be payable to the County of Clarke.

4. **All bonds shall be obtained at the bidder's expense and shall be included in the bid price.**

5. Vendors are responsible for all costs associated in preparing a bid submittal. The County will not pay for any costs associated with preparing a bid.

6. Insurance Requirements

a) A **Certificate of Insurance will be required from the selected vendor**; please refer to General Terms and Conditions for complete instructions. Please include a sample of your Certificate of Insurance with your bid. All vendors shall include the cost of insurance in their bid pricing.

b) **Due to the type of work involved with this project, the County is requiring that the selected vendor (no matter how many employees the vendor has) have Worker's Compensation Insurance before starting any work with Clarke County.** All vendors shall include the cost of worker's compensation insurance in their bid pricing. The selected vendor must provide evidence of Worker's Compensation Insurance coverage before starting any work. All contractors are solely responsible for insuring their workers and themselves when doing work for Clarke County.

c) Be sure to instruct your insurance carrier as to how the Certificate of Insurance is to be worded.

d) Contractor shall be responsible for requiring any subcontractors to have the same amounts/types of insurance as the Contractor.

e) If you have any questions regarding these limits, please contact the Clarke County Purchasing Office for clarification and discussion.

f) Note that the selected vendor shall furnish the County with all certificates of insurance, endorsements, declaration pages, and policies affecting coverage. The selected vendor must provide an endorsement

letter that verifies that Clarke County, its officers, officials, employees, volunteers and agents (as their interest may appear)” are additionally insured.

7. Permits and Licenses

- a) Clarke County Business License and/or a License from the Town of Berryville may be required. Please contact the Town of Berryville (540-955-1099) and the Clarke County Commissioner of the Revenue (540-955-5187) for more information. Only the selected vendor would be required to have a business license from the Town or County, if applicable.
- b) It shall be the selected vendor’s responsibility to pay for any other permits or licenses (building, town, etc.) that may be required for this project. The Clarke County Building Department can be reached at (540) 955-5112.
- c.) The selected vendor must have a valid Virginia Contractor’s License. Interested vendors should include a copy of their Virginia Contractor’s License with their respective bid.

J. Bid Requirements

- 1. One (1) original and two (2) copies of each bid are requested. The original should be clearly marked “ORIGINAL” on the front of the bid.
- 2. Bids should be prepared simply and economically, providing a complete and concise description of capabilities to satisfy the requirements of the IFB. Emphasis should be placed on completeness and clarity of content.
- 3. Ownership of all data, materials, and documentation originated and prepared for the IFB shall belong exclusively to Clarke County and shall be subject to public inspection in accordance with the Virginia Freedom of Information Act. Trade secrets or proprietary information submitted by a vendor shall not be subject to public disclosure; however, the vendor must **clearly** identify the sections by marking “Proprietary” at the top of each applicable page and must explain why the protection is necessary.

K. Submittals

- 1. Interested vendors should submit the following in their sealed bids. Note that vendors should submit these documents with their bid even if the County already has them on file from previous jobs, responses, etc.

a. Attachment A: Bid Response Form.

b. Attachment B: Reference Form.

c. Attachment C - SCC Form.

Per § 2.2-4311.2 of the Virginia Public Procurement Act, any contractor/vendor organized as a stock or nonstock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability partnership must be authorized to transact business in the Commonwealth of Virginia as a domestic or foreign business entity if so required by Title 13.1 or Title 50 or as otherwise required by law.

Vendors submitting a bid/proposal shall include the identification number that was issued to them by the State Corporation Commission. Any vendor that is not required to be authorized to transact business in the Commonwealth as a foreign business entity under Title 13.1 or Title 50 or as otherwise required by law shall include in its quote a statement describing why the vendor is not required to be so authorized.

d. Attachment D- Company Certification Form.

e. A sample copy of your **Certificate of Insurance** showing coverage. The selected vendor shall provide the County with a Certificate Insurance having Clarke County listed as the Certificate Holder and as Additionally Insured.

f. A signed copy of any **addendum** issued before bid opening date and time.

g. Bid Bond.

h. Copies of **any required license**, (state, local, etc.) for this type of work.

i. Please include a copy of your Virginia Contractor's License with your bid.

2. Bids must be submitted in a **sealed envelope or box** and should be clearly marked:

“IFB #16-0525, HVAC-D.G. Cooley Elementary-Lower Campus”, and sent to:

Clarke County Purchasing
129 Ramsburg Lane
Berryville, VA 22611

3. Bids must be received in the Clarke County Purchasing Office before 3:00 p.m. (local prevailing time) on Wednesday, May 25, 2016 at which time they will be publicly opened and read aloud. Bids submitted after this time will not be accepted. The official time will be determined by the clock in the Clarke County Purchasing Office.

L. Contract Method and Terms

1. Upon review and approval by Clarke County, a purchase order will be issued to Contractor. Receipt of purchase order by Contractor shall be considered the "Notice to Proceed" with starting date indicated.
2. The award shall be based on the contractor's ability to meet all IFB requirements.
3. The Selected Contractor should submit to Clarke County an itemized application for payment as work is completed or one invoice after the successful completion of the project.
4. Vendors should be aware that the County typically does not pay deposits or for work not yet completed.

M. Final Inspection

1. After the completion of any work and before a final payment is approved, a satisfactory inspection of the work may be required by Clarke County.
2. The Contractor, before final acceptance by Clarke County shall correct any errors or defects in workmanship.
3. A final inspection and/or acceptance does not relieve the Contractor from any responsibility regarding defects or other failures to meet the contract requirements.

N. Bid Evaluation Criteria

1. Pricing will be the evaluation criteria for choosing the selected vendor.
2. The selected vendor must be determined to be a responsible and responsive vendor by the County.

O. Independent Contractor.

1. The selected vendor will be hired as an independent contractor and thus, agrees and understands that they, the vendor and its employees, are not employed by the County of the Clarke or Clarke County Public Schools.

P. Codes, Permits, Fees, License, and Notices

1. None of the terms or provisions of these specifications shall be construed as waiving any other rules, regulations or requirements of authorities.
2. It is the responsibility of the Contractor to obtain and pay for all necessary permits, inspections, licenses and notices.
3. Costs for these shall be the responsibility of the Contractor and shall be included in the estimate or cost of repairs.
4. The Contractor shall supply, when requested, copies of permits and licenses to Clarke County.
5. The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations, and lawful orders of any public authority bearing on the performance of the work.
6. In any instance where these specifications call for materials for construction of a better quality or larger size than required by codes, the provision of these specifications shall take precedence. In other words, should the Codes call for better quality or larger size, the codes shall govern.

Q. Contractor's Duties

1. All work performed under this contract shall be performed in accordance with all provisions of these specifications or plans and must be approved in writing by Clarke County or authorized representative.
2. The Contractor shall immediately upon discovery, bring to the attention of Clarke County any conflicts that may occur among the various provisions of the specifications and plans.
3. Clarke County shall resolve such conflicts and shall be responsible for any cost reasonably incurred by the Contractor due to such conflict.
4. Failure of the Contractor to bring conflicts or exceptions to the attention of Clarke County shall allow Clarke County to require any changes deemed necessary before acceptance by Clarke County.

5. Contractor shall be responsible for all property damaged, or persons injured, by the Contractor's and/or subcontractors' negligence. This includes, but is not limited to, fences, trees, plants, grass, walks, drives, building surfaces – interior/exterior, visitors, visitors' belongings and vehicles, county equipment, building contents, etc.

6. Inspection and Acceptance

- a) The selected vendor should examine areas and conditions under which work is scheduled to occur and notify the County of conditions detrimental to proper and timely completion of work.
- b) Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to applicator.

R. Material Delivery, Storage and Handling (if applicable)

- 1. Contractor shall be responsible for (1) the protection of materials from deterioration during delivery, and while stored on site, and (2) all project related deliveries to the site, and materials stored on site.
- 2. Clarke County is not responsible for any material or equipment that is stored or left on Clarke County property.
- 3. Materials shall be stored in a neat and safe way as to prevent any type of accident.

S. Owner's Access

- 1. Clarke County shall have access at all times to the work site.
- 2. The Contractor shall keep Clarke County advised of the progress of the project and shall provide opportunity for Clarke County to inspect each phase of the project.
- 3. The Contractor shall provide proper and safe facilities for such access and inspection.

T. Stop Work Notice - Clarke County reserves the right to stop work temporarily at any location because of weather conditions, lack of materials, safety violations, special functions, and/or performance not in accordance with the contract or any other unforeseen circumstances.

U. Procedures for Authority, Workmanship, Inspection and Clean-up

1. Authority.....The extent and character of the services to be performed by the Contractor shall be subject to the general control and approval of the County authorized representative.

- a) The Contractor shall comply with requests and/or orders issued by the authorized representative(s) acting within their authority for Clarke County.
- b) The Director of Joint Administrative Services must approve any change to the contract in writing.

2. Workmanship.....All work under the resulting contract shall be performed in a skillful and workmanlike manner. Clarke County may require the Contractor to remove from the job site any Contractor's employee deemed to be incompetent or careless.

- a) Contractor shall be responsible for conduct and supervision of its personnel.
- b) There shall be no drinking of alcoholic beverages or use of any controlled substance by Contractor's personnel.
- c) There shall be no smoking/vaping in any County-owned building. There shall be no smoking/vaping in any School Building or any School Property.

3. Inspection.....Clarke County may, from time to time, make inspections of the work performed under this contract. Any inspection by Clarke County does not relieve the Contractor from any responsibility regarding defects or other failures to meet the contract requirements.

4. Clean-Up.....The Contractor(s) shall at all times keep the adjacent areas of the property free from rubbish and the accumulation of any waste materials. All waste materials are to be removed from the site and disposed of properly.

V. Special Requirements

1. Accident Prevention and Safety - Each Contractor shall:

- a) Comply with all applicable laws, ordinances, rules, regulations and orders of governing authorities having jurisdiction for the safety of all persons and property to protect them from damage, injury or loss.
- b) Erect and maintain, as required by conditions and progress of work, all necessary safeguards for safety and protection, including fences, railings, barricades, lighting, posting of danger signs and other warnings against hazards.

c) Be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with this Contract.

2. Work hours - Normal work hours are from 7:30 a.m. to 5:00 p.m., Monday through Friday. These hours may be extended, contingent on Clarke County's approval.

3. Work adjacent to private property - Contractor shall conduct construction activities in a manner that will not interfere with adjacent property

4. Urgent reports - It is imperative that each Contractor immediately contact Clarke County in the event of any of the following incidents:

a) Accidents - report immediately.

b) Situations or circumstances that could delay work or give cause for claims for extensions or added costs.

c) Instructions and/or clarifications requested.

END OF SECTIONII: SPECIAL TERMS AND CONDITIONS

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III. SCOPE OF WORK. Clarke County Public Schools has hired Lawrence Perry Associates to provide the following scope of work.

SECTION 23 00 00

HEATING, VENTILATING AND AIR-CONDITIONING (HVAC)

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This section of the specifications shall be applicable to all phases of mechanical work covered by specifications and drawings issued for this project.
- B. The "General Conditions of the Contract", "Supplementary General Conditions", and all other similar general requirements issued for this project shall apply to all mechanical work and are hereby made a part of this section.
- C. The Contractor and/or his representatives shall be fully acquainted with the design and operation of the systems and equipment described in these specifications and on the drawings.
- D. Work included under this section shall include complete systems as shown on the plans and as specified. Provide supervision, labor, material, equipment, machinery, plant, and other items necessary to complete the mechanical systems. It is the intention of these specifications and drawings to call for finished work, tested, and ready for operation.
- E. Definitions:
 - 1. "Owner" and "Contractor" shall mean the respective parties to the prime contract governing the project. Only one contractor is recognized as a party to this contract. Where the terms "Mechanical Contractor" or "Subcontractor" are used, it is for convenience only.
 - 2. "Architect/Engineer" shall mean the firm and authorized representatives of the firm engaged by the Owner for architectural and engineering services related to this project.
 - 3. "Mechanical" shall mean all work related to air conditioning, heating, ventilation, plumbing, sprinkler systems, noise and vibration control, and similar work, including all related components, accessories, controls, and miscellaneous work required for a complete system.

4. "Contract Documents" shall mean and include the agreement, the drawings and specifications and all modifications thereto authorized by the Owner in writing prior to final completion of the project.
 - a. The term "Agreement" shall mean the completed and signed contract form.
 - b. The term "Drawings" shall mean the drawings prepared by the Architect/Engineer for specific use in bidding and execution of the work.
 - c. The term "Specifications" shall include the legal and procedural documents, the general conditions, special conditions, and the technical specifications.
 - d. The term "Technical Specifications" shall mean that part of the specifications which describes, outlines, and stipulates the kind and quality of the materials to be furnished, the quality of workmanship required, and the methods to be used in the construction under the contract. For convenience, the mechanical portions of the technical specifications are arranged into one general section and several detailed sections related to the various trades represented in the work. Such arrangement and references shall not operate to make the Architect/Engineer an arbiter in establishing the limits of any subcontract or trade.
5. "Work" of the Contractor shall mean labor or materials or both.
6. "As shown", "as indicated", "as detailed", or words of similar import shall mean reference to the drawings included in the contract documents, unless stated otherwise.
7. "As directed", "as required", "as permitted", "approved", or words of similar import shall mean that the direction, requirement, permission, approval, or acceptance of the Architect/Engineer is intended unless stated otherwise.
8. "As necessary" shall mean that which is necessary to achieve satisfactory completion of the work in order to provide the intended function and form of the project in compliance with the contract documents.
9. "Provide" shall mean "provide complete and in place", that is "furnish and install", ready for beneficial occupancy by the Owner. Except where stated otherwise, description of any work in the contract documents shall mean that the work shall be provided by the Contractor, even though the words "provide" or "furnish and install" do not accompany the description.

10. "Similar" shall be interpreted in a general sense and not as meaning identical, and all related details shall be worked out in respect to their location and their connection with other parts of the work.
11. Exposed: Piping, ductwork, and equipment exposed to view in finished rooms.
12. Option or Optional: Contractor's choice of an alternate material or method.

1.02 INTENT OF CONTRACT DOCUMENTS:

- A. The contract documents are complementary, and what is called for in one place shall be as binding as if called for in all places. Where variances occur between drawings and specifications or within either document itself, include in the contract price the item or arrangement of better quality, greater quantity, or higher cost. Agreement shall take precedence over the specifications and drawings. Figured dimensions shall be used in preference to scaling the drawings. In case of conflict between large and small scale drawings, the large scale drawings shall govern.
- B. The mechanical drawings show the general arrangement of all piping, equipment, and appurtenances and shall be followed as closely as actual building construction and the work of other trades will permit. The mechanical work shall conform to the requirements shown on all of the drawings. Architectural and structural drawings shall take precedence over mechanical drawings. Because of the small scale of the mechanical drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. The Contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings, valves, boxes, offsets, transitions, and other accessories as may be required to meet such conditions.

1.03 CODES AND STANDARDS:

- A. All materials and workmanship shall comply with all applicable codes, state and federal laws, local ordinances, industry standards, utility company regulations, and all other criteria which normally apply to work of this nature.
- B. In case of difference between building codes, state laws, federal laws, local ordinances, industry standards, utility company regulations, other criteria and the contract documents, the more stringent regulations will apply. The Contractor shall promptly notify the Architect/Engineer in writing of any such difference.
- C. If the Contractor performs any work that does not comply with these contract documents or the requirements of the applicable building codes, state laws, local ordinances, industry standards, utility company regulations, and other applicable criteria, he shall bear all costs arising in correcting the deficiencies.

- D. The standards referred to, except as modified in the specifications, shall have full force and effect as though printed in these specifications. The manufacturer and trades involved shall be familiar with the application of these standards.
- E. Applicable codes and standards shall include, but are not necessarily restricted to, the most recently recognized issues of the following:
 - 1. Building Codes:
 - a. Virginia Construction Code
 - b. International Mechanical Code and accumulative supplements
 - 2. Industry Standards, Codes, and Specifications:
 - a. AGA - American Gas Association
 - b. ARI - Air Conditioning and Refrigeration Institute
 - c. AMCA - Air Moving and Conditioning Association
 - d. ANSI - American National Standards Institute
 - e. ASHRAE - American Society of Heating, Refrigeration, and Air Conditioning Engineers
 - f. ASME - American Society of Mechanical Engineers
 - g. ASTM - American Society of Testing and Materials
 - h. AWS - American Welding Society
 - i. FIA - Factory Insurance Association
 - j. FM - Factory Mutual
 - k. IBR - Institute of Boiler and Radiator Manufacturers
 - l. IRI - Industrial Risk Insurers
 - m. ISO - Insurance Services Office
 - n. MSS - Manufacturer's Standardization Society of the Valve and Fittings Industry, Inc.
 - o. NBS - National Bureau of Standards
 - p. NEC - National Electrical Code
 - q. NFPA - National Fire Protection Association
 - r. UL - Underwriters' Laboratories, Inc.
 - ssb. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association

1.04 GOVERNMENTAL FEES, PERMITS, AND INSPECTIONS:

- A. Under each applicable section of the detailed mechanical specifications, the Contractor shall obtain and pay for all required licenses, permits, charges for connections to outside services, fees and inspections. Upon completion of the work under each section of the detailed mechanical specifications, the Contractor shall furnish a certificate of final inspection to the Architect/Engineer from the governmental inspection department having jurisdiction.

1.05 VISITING THE SITE:

- A. Each Contractor shall be responsible for visiting the site before bidding the job to familiarize himself with all existing conditions to be met in the execution of the work under this contract. No additional compensation will be allowed for any changes which may be required to make because of site conditions.

1.06 QUALITY ASSURANCE:

A. Product Criteria:

1. All materials shall be new and shall bear the manufacturer's name, trade name, and the UL label in every case where a standard has been established for this particular material. The equipment to be furnished shall be essentially the standard product of a manufacturer regularly engaged in the production of the required type of equipment, and shall be the manufacturer's latest approved design. All equipment shall bear a permanent and legible factory-applied nameplate to permit identification of manufacturer, model number and type of unit.
2. Equipment Service: Products shall be supported by a service organization which maintains an adequate inventory of repair parts and is located, in the opinion of the Architect/Engineer, reasonably close to the site.
3. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer to provide for uniform appearance, operation, and maintenance.
4. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.

- B. Manufacturers' directions shall be followed in the delivery, storage, protection, and installation of all equipment and materials. The Contractor shall promptly notify the Architect/Engineer in writing of any conflict between any requirements of the contract documents and the written instructions before proceeding with the work. If the Contractor performs any work that does not comply with the manufacturers' directions or such written instructions from the Architect/Engineer, he shall bear all costs arising in correcting the deficiencies.

- C. Factory Start-up by the manufacturer's Factory Certified Representative shall be provided for each Cooling Tower. Letters signed by the Representative stating that their equipment has been started, tested, and is operating safely shall be submitted to the Owner as part of the bound Operations and Maintenance Instructions manual specified in section 2.10 CATALOG DATA FOR OWNER of this specification.

1.07 BIDDING INSTRUCTIONS:

- A. Products are generally specified by a performance specification and/or by manufacturer's name and model number or trade name.
- B. When specified only by a performance specification, the Contractor may use any manufacturer who meets the performance specification and applicable codes. (The Contractor shall be subject to the requirements of 1.09 - SHOP DRAWINGS.)
- C. When several products/manufacturers are specified together, then the Contractor has the option of using any product/manufacturer listed. The Contractor shall be subject to the requirements of 1.09 - SHOP DRAWINGS. The Contractor's bid shall be compiled on the use of the listed products without exception. Substitutions will only be considered after the contract has been executed and shall be subject to the requirements of 1.08 - SUBSTITUTIONS.
- D. When several products/manufacturers are specified together and the system design is based on one of the listed products by specific model number(s) or catalog number(s), then the Contractor has the option of using the one specific product or any other product/manufacturer listed. In either case, the Contractor shall be subject to the requirements of 1.09 - SHOP DRAWINGS. However, when the other listed product/manufacturer is used, the Contractor shall be responsible for determining that the product(s) will be compatible with building design, electrical design, mechanical design, and the product(s) will not necessitate design modifications by the Architect/Engineer. The Contractor's bid shall be compiled on the use of the listed products without exception. Substitutions will only be considered after the Contract has been executed and shall be subject to the requirements of 1.08 - SUBSTITUTIONS. If the products/manufacturers are listed to be "only", then substitutions will not be considered.
- E. When only one manufacturer's name is listed, this shall be the basis of the bid. The Contractor's bid shall be compiled on the use of the listed product. Substitutions will only be considered after the Contract has been executed and shall be subject to the requirements of 1.08 - SUBSTITUTIONS.

1.08 SUBSTITUTIONS:

- A. Substitutions will not be considered during the bid.
- B. After the Contract has been executed, the Architect/Engineer will consider a formal request for a review of substituted products in place of those specified, under the following conditions:
 - 1. Not later than 30 days from the Contract Date, the Contractor shall provide a list of products proposed as substitutions, including the name, manufacturer, and section of the specifications governing the product.

2. The request shall be accompanied by accurate cost data on the proposed substitutions indicating whether or not a modification of the Contract Sum is to be considered.
- C. Substitutions are understood to mean that the installing Contractor:
1. Has personally investigated the proposed substitute and has determined that it is equal or superior in all respects to the item specified;
 2. Will provide the same guarantee for the substitution that he would for the item or equipment specified;
 3. Certifies that the cost data is complete and includes all related costs under this Contract, and waives all claims for additional cost related to the installation of the accepted substitute;
 4. Has coordinated the installation of the substitute, providing design modifications and changes as required for the work to be complete in all respects;
 5. Has coordinated the installation of the substitute with the General Contractor pertaining to changes required for the work to be complete with all trades and all changes shall be provided without additional cost to the Owner.
- D. The acceptance by the Architect/Engineer of any or all of those substitute items listed by the Contractor for review shall not constitute an approval of the substitute but shall mean that the Contractor may then submit detailed shop drawings for review. When a request for substitution is granted, shop drawings will be reviewed by the Architect/Engineer. Shop drawings not complete with proper review information will not be reviewed and will be returned unchecked. If after two submittals, the substitute equipment is not approved, the specified equipment shall be provided.
- E. When a request for substitution is granted, shop drawings will be reviewed by the Architect/Engineer. Shop drawings not complete with proper review information will not be reviewed and will be returned unchecked. If after two submittals, the substitute equipment is not approved, the specified equipment shall be provided.

1.09 SHOP DRAWINGS:

- A. Shop Drawings are required for all material and equipment that is specified by a manufacturer's name or as indicated in the technical specifications. Furnish the number of copies required by the General and Special Conditions of the Contract, but in no case less than six (6) copies. Submittal data for related equipment shall be submitted at one time.

- B. Substitutions will not be considered if:
1. They are indicated or implied on shop drawing submissions without information specified in 1.08 - SUBSTITUTIONS.
 2. They require a substantial revision of the Contract Documents in order to accommodate their use.
- C. Identify submittals with PROJECT NAME and NUMBER, CONTRACTOR'S NAME, SECTION NUMBER & NAME, and PARAGRAPH NUMBER of SPECIFICATION GOVERNING, MANUFACTURER, MODEL or STYLE, and CONTRACTOR's REVIEW STAMP. Submittals shall be detailed, dimensioned drawings showing construction, size and arrangement, service clearances, performance characteristics, and capacity. Submittals not properly identified or containing information of a general nature will not be reviewed and will be returned unchecked.
- D. Acceptance of shop drawings shall not be considered as a guarantee of measurements or building conditions. Acceptance shall not relieve the Contractor from the responsibility or necessity of furnishing material or performing work required by the drawings and specifications. Submittal data on any one item shall not be reviewed more than three (3) times. If not accepted after the third review, the Contractor shall provide the equipment upon which the design was based.
- E. Failure to submit shop drawings in ample time for checking shall not entitle an extension of contract time, and no claim for extension by reason of such default will be allowed.
- F. No material or equipment, for which submittals are required, may be delivered to or installed at the job site until submittals have been accepted.
- G. Unless a specific finish is indicated in the contract documents, wherever a choice of finish is available for the specified item, submit accurate color chips or charts to the Architect for review and selection.

PART 2 - PRODUCTS

2.01 DRIVE GUARDS:

- A. For machinery and equipment, provide guards as shown in AMCA 410 for belts, chains, couplings, pulleys, sheaves, shafts, gears and other moving parts regardless of height above the floor. Drive guards may be excluded where motors and drives are inside factory fabricated unit casings.

- B. Materials: Sheet steel, cast iron, expanded metal or wire mesh rigidly secured so as to be removable without disassembling pipe, duct, or electrical connections to equipment.
- C. Access for Speed Measurement: One inch diameter hole at each shaft center.
- D. Lubrication: Guards shall not interfere with lubrication of equipment.

2.02 PAINTING:

- A. General - Paint mechanical and electrical equipment and material in Equipment Rooms and utility type areas and located outside of the building or on the roof. Painting of equipment and material in finished rooms or areas shall be accomplished as described in PAINTING Section of the Architectural Specifications. Painting in concealed spaces shall be limited to equipment and materials not otherwise protected from rusting such as hangers and supports. Paint shall be products of Sherwin-Williams, Pittsburgh, or Pratt-Lambert. All paints, finishes and coatings shall comply with Green Seal Standard GS-11, GS-03, and SCAQMD Rule #1113 VOC limits for paints and coatings
- B. Workmanship - The work shall be accomplished by workmen skilled in the painting trade after testing is complete and systems are ready for operation. Surfaces to be painted shall be completely dry before applying paint. Surfaces shall not be painted when the temperature is below 50 Deg. F or above 120 Deg. F, or when they are exposed to hot sun. Materials shall be evenly spread and smoothly flowed on without runs or sags. Each coat shall be thoroughly dry before application of succeeding coat. The painters shall protect adjacent surfaces with drip covers during the process of painting. Upon completion, paint spots, if any, shall be removed from adjacent surfaces.
- C. Preparation of surface - Metal surfaces shall be cleaned with solvent before applying materials. Rust and scale shall be removed by wire brushing or sanding. Galvanized surfaces shall be pretreated with a phosphoric acid cleaning solution and primed with Sherwin-Williams "Galvanized Iron Primer".
- D. Painting - After preparation as described above, each item shall be painted as follows, except color of paint for equipment and material located outside of the building or on the roof shall be as selected by the Architect.
 - 1. Painting is not required of equipment, equipment supports, and hangers with a factory-finish coat. Patch painting is required of any damaged areas to match factory-finish coat. Painting is required where equipment or equipment supports do not have factory-finish paint. Painting shall be as follows:

- a. Uninsulated boiler surfaces and other similar hot surfaces shall be painted with two coats of silicone alkyd aluminum paint with a dry temperature resistance of 1000 Deg. F.
 - b. Other equipment and associated hangers and supports shall be primed with one coat of alkyd, zinc potassium chromate metal primer, except insulated surfaces shall be primed with one coat Sherwin-Williams "Wall Primer and Sealer." Finish with two coats of Sherwin-Williams Steel Gray Enamel. Exterior of belt guards and other protective guards shall be finished with two coats of machinery enamel in OSHA yellow color. Interior of items covered by belt guards and other protective guards shall be finished with two coats of machinery enamel in OSHA orange color. Nameplates on equipment shall not be painted.
2. Ducts, pipes, and conduits - Interior duct behind grilles, registers, and diffusers shall have 1 finish coat of Sherwin-Williams Black Enamel. Exposed duct, pipes, conduits, and associated hangers exposed in equipment rooms and other unfinished areas such as storage areas shall have two finish coats of paint of the same color as adjacent walls or ceilings. Bare copper pipe shall not be painted. Canvas or paper jacket insulation of pipes or duct exposed in unfinished areas shall be primed and sealed before final two coats of paint. Hangers and supports in concealed areas not protected by factory-finish paint shall have one coat of metal primer.

E. Identification of pipes and equipment:

1. Equipment - Each piece of equipment shall be identified by stenciled marking that will read the same as the identification shown on mechanical or electrical drawings. Stencil letters shall be 2 inches high upper case painted with white enamel.

F. Identification of Valves: Properly mark service and control valves. Valve markers shall be metal tags with designations stamped thereon or laminated engraved plastic chained to their respective valves. Identification symbols or designations shall be the same as shown on the Contract Documents.

2.03 MOTORS, CONTROL, AND ELECTRICAL WIRING:

- A. Provide motors in accordance with NEMA Standards and suitably designed to match the starting and running characteristics of the driven equipment. Unless indicated otherwise, motors less than 1/2 horsepower shall be wound for 120 volt, single phase, 60 hertz. Motors 1/2 horsepower and above, unless indicated otherwise, shall be wound for three phase, 60 hertz, 200 volt, 230 volt, or 460 volt as required by the system voltage. Select motors coordinated with the utilization voltage and phase. Motors for equipment with VFD shall be matched to the VFD.

- B. All starters and safety switches, except for those specified to be furnished with the mechanical equipment, shall be furnished as part of the Electrical Work - Division 26.
- C. Starters and safety switches furnished with the mechanical equipment shall comply with the specifications of Sections 26 28 16 and 26 29 13.13. Starters furnished as an integral part of the mechanical equipment shall be complete with properly sized overload heaters. Integral 3-phase motor starters and VFD's shall be provided with phase loss protection.
- D. Temperature control wiring shall be furnished as part of the Mechanical Work, Section 23 09 00 - INSTRUMENTATION AND CONTROL FOR HVAC. Temperature control wiring is any wiring, regardless of voltage, related to mechanical equipment that is not the equipment power circuit from the circuit breaker in the panelboard to the motor starter or safety disconnect switch and to the motor or equipment junction box. Temperature control wiring shall include, regardless of voltage, power for control panels, power for actuators, signal for input and outputs, interlocks, and line voltage as herein specified to provide the proper operation and sequence of control for all heating, ventilating, and air conditioning equipment. All wiring shall conform to applicable sections of Division 26, 27 and 28 of the specifications.
 - 1. Power for control panels shall be provided by Controls Contractor and shall be obtained from nearest receptacle or unswitched 120 volt lighting circuit. Control Contractor shall coordinate with Electrical Contractor when connecting to these circuits. Circuit directories in panelboards shall indicate where control panels are connected. When control panels require voltage other than 120 VAC, Control Contractor shall provide transformer to reduce voltage. All wiring shall conform to applicable sections of Division 26, 27 and 28 of the specifications.
 - 2. Power for damper actuators and valves which are an integral part of mechanical equipment shall be provided by the Controls Contractor and shall be obtained from the power source to the equipment or the nearest receptacle circuit. Where power requirement for the actuator or valve is different from that supplied to the equipment, the Controls Contractor shall provide a transformer or tap the nearest receptacle circuit or unswitched 120 volt lighting circuit. Dampers located at fans shall be considered an integral part of the mechanical equipment and shall be factory wired to the equipment power source.
 - 3. Where equipment is controlled by a line voltage control device (thermostat, On-Off switch, Speed Switch, etc.) the Controls Contractor shall wire from the control device to the equipment, unless specifically indicated otherwise on the drawings.
 - 4. Where control devices that are intended to interrupt the motor or equipment power circuit are provided by the Control System Contractor and are mounted other than on or directly adjacent to the controlled equipment, the Control

System Contractor shall provide wiring through these devices regardless of voltage or phases.

5. All low voltage control wiring in inaccessible areas or in exposed areas shall be in metal conduit and shall comply with the specifications of Divisions 26, 27 and 28. All low voltage control wiring in unexposed, accessible areas shall be wire in conduit or U.L. approved plenum rated cable supported from the structure with ties spaced 4'-0" on center. Cable shall not be supported on ceiling, lights, or pipes. All low voltage control wiring penetrating walls or floors shall be in conduits. All 120 volt wiring shall be wire in conduit and shall comply with the specifications of Division 26, 27 and 28. All wall-mounted thermostats, sensors, and switches shall be mounted in recessed metal rough-in box.
6. The Controls Contractor shall coordinate with the Electrical Contractor all 120 volt power source, connections required for the controls system. The Controls Contractor shall verify that wiring of motors and controls provides the correct sequence of operation.
7. All equipment that has electrical connections shall have wiring terminals/connectors rated for not less than 75 deg. C. If terminals/connectors are provided and are rated for less than 75 deg. C., the mechanical contractor shall incur all costs associated with upsizing wire and conduit as required by the National Electrical Code.

2.04 FIRE-STOPPING:

- A. Pipe penetrations of rated walls, floors, and floor-ceiling assemblies shall be constructed in accordance with Underwriter's Laboratories, Inc., Fire Resistance Directory, Volume II, Hourly Ratings for Through Firestop Penetrations. The Contractor shall provide U.L. firestop penetrations according to the particular wall, floor, or floor-ceiling assembly rating, construction type, pipe material, pipe size, insulation requirements, sleeve requirements, and the contractor's choice of firestop products as listed by U.L. Refer to the architectural drawings for the wall, floor, or floor-ceiling assembly construction types and ratings.

2.05 PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS:

- A. Under each applicable section of the detailed mechanical specifications, the Contractor shall furnish and install all accessories, connections, bases, guards, supports, and incidental items necessary to fully complete the work, ready for use, occupancy, and operation by the Owner.
- B. Type Numbers Specified: MSS SP-58; for selection and application, MSS SP-69. Refer to Section METAL FABRICATIONS, for miscellaneous metal support materials and prime coat painting.

C. For Attachment to Concrete Construction

1. Concrete Insert: MSS SP-69, Type 18
2. Self-Drilling Expansion Shields and Machine Bolt Expansion Anchors: Fed. Spec. FF-S-325, permitted in concrete not less than four inches thick. Applied load shall not exceed one-fourth the proof test load listed in Fed. Spec. FF-S-235.
3. Power-Driven Fasteners: Permitted in existing concrete or masonry not less than four inches thick when approved by the Architect/ Engineer for each job condition. Use fasteners capable of supporting a 1000 pound test load, with the actual load not exceeding 50 pounds.

D. For Attachment to Steel Construction; MSS SP-69:

1. Welded Attachment: Type 22.
2. Beam Clamps: Types 20, 21, 23, 28 or 29.

E. Attachment to Metal Pan or Deck: As required for materials specified in Section METAL DECKING.

F. For Attachment to Wood Construction: Wood screws or lag bolts.

G. Hanger Rods: Hot-rolled steel, ASTM A 36 or A 575 for allowable load listed in MSS SP-58. For piping, provide adjustment means for controlling level or slope. Types 13 or 15 turnbuckles shall provide 1-1/2 inches minimum of adjustment and incorporate locknuts. All-thread rods are acceptable.

H. Multiple (Trapeze) Hangers: Galvanized, cold formed, lipped steel channel horizontal member, not less than 1-1/2 inches by 1-1/2 inches, No. 12 gage, designed to accept special spring held, hardened steel nuts. Not permitted for steam supply and condensate piping, fire and sprinkler piping, or chemical waste drain piping.

1. Allowable Hanger Load: Manufacturers rating less 200 pounds.
2. Guide individual pipes on the horizontal member of every other trapeze hanger with 1/4-inch U-bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 2-inch galvanized steel bands, for insulated piping at each hanger.

I. Pipe Hangers and Supports: Use hangers sized to encircle insulation on insulated piping. Refer to Section 23 07 00, HVAC INSULATION, for insulation thickness. To protect insulation, provide Type 39 saddles for roller type supports. Provide Type

40 insulation shields at all other types of supports and hangers including those for pre-insulated piping.

1. General Types (MSS SP-69):

- a. Standard Clevis Hanger: Type 1; provide locknut.
- b. Riser Clamps: Type 8 or 42.
- c. Wall Brackets: Types 31, 32, or 33.
- d. Roller Supports: Type 41, 43 and 46.
- e. Saddle Support: Type 36, 37, or 38.
- f. Turnbuckle: Types 13 or 15.
- g. U-Bolt Clamp: Type 24.
- h. For Uninsulated Copper Tube: Material compatible for use with copper to prevent electrolysis.
- i. Supports for Plastic or Glass Piping: As recommended by the pipe manufacturer.

J. Concrete Equipment Bases: Unless otherwise noted on the drawings or in the specifications, concrete pads and bases not less than 4 inches high and which project not less than 3 inches beyond the equipment on all sides shall be provided for air handling units, fans, pumps, compressors, boilers, tank supports, and other similar floor-mounted equipment which normally requires foundations. Concrete shall conform to requirements in the concrete section of these specifications. The trade responsible for the supported equipment shall establish sizes and locations of the various concrete bases required and shall provide all necessary anchor bolts, together with templates for holding these bolts in position. Anchor bolts shall be placed in steel pipe sleeves to allow for adjustment, with a suitable plate at bottom end of sleeve to hold the bolt. When indicated in the drawings or detailed specifications, other floor-mounted items of equipment shall have a similar concrete base. Special vibration isolation foundations that are required are specified in the detailed specifications.

2.06 PIPE SLEEVES:

- A. Locate sleeves during normal course of work. Provide sleeves for piping and conduit passing through concrete floor slabs and concrete, masonry, tile, and gypsum wall construction. Sleeves shall not be provided for piping and conduit running embedded in concrete or slab on grade, except that copper piping shall require sleeves through slabs on grade. Sleeves through structural members shall be only as directed by Architect. In interior wall, provide 1/4 inch space all around between sleeve and conduit, piping, or insulation of piping.
- B. Sleeves placed in exterior walls below grade shall be O.Z. Gedney Type 'FSK' or equal, Thunderline 'LINK SEAL', or equal sleeve assemblies sized for the pipe or conduit encountered, except for cast iron piping. Sleeve assembly shall provide watertight seal and electrical insulation to reduce cathodic reaction. When a sleeve

passes through a wall below a concrete slab on grade, the sealing assembly shall be on the outside of the wall. When a sleeve passes through a wall into a crawl space or the building interior, the sealing assembly shall be in the crawl space or interior of the building. Provide sleeve assembly for copper piping through slab on grade, with sealing assembly located on interior side of floor slab. Where cast iron pipes pass through an exterior wall below grade, provide an iron-pipe sleeve two (2) pipe sizes greater than pipe passing through. Caulk between pipe and sleeve with a rubber-based compound.

- C. Where sleeves are located through fire-rated walls and floor/ceiling assemblies, provide sleeves and protect the penetration in accordance with Underwriter's Laboratories, Inc., Fire Resistance Directory, Volume II, Ratings for Through Firestop Penetrations.
- D. Sleeves in mechanical rooms with floor drains or hose bibbs shall extend 4 inches above floor. Provide flanges or flashing rings with sleeves in floors with waterproof membrane and clamp or flash into the membrane. Provide sleeves flush with floor in other rooms.
- E. Sleeves shall be constructed of 20 gage galvanized sheet steel with lock seam joints for all sleeves set in concrete floor slabs terminating flush with the floor. All other sleeves shall be constructed of galvanized steel pipe unless otherwise indicated.
- F. Fasten sleeves securely in floors or walls so that they will not become displaced when concrete is poured or when other construction is built around them. Take precautions to prevent concrete, plaster, or other materials from being forced into the space between pipe and sleeve during construction.

2.07 WALL, FLOOR AND CEILING PLATES (ESCUTCHEONS):

- A. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with setscrew for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes, and cover the entire pipe sleeve projection.
- B. Thickness: Not less than 3/32-inch for floor plates. For wall and ceiling plates, not less than 0.025 for up to 3-inch pipe, 0.035 for larger pipe.
- C. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, except mechanical rooms.

2.08 ACCESS PANELS:

- A. Under each applicable section of the detailed mechanical specifications, the Contractor shall provide access panels in all locations where required for access to concealed valves, traps, air cushions, controls, dampers, damper operators, junction

- boxes, and any other equipment or materials requiring inspection or maintenance. Access panels shall be of adequate size and properly located so that concealed items will be readily accessible for servicing or for removing and replacing if necessary, except as indicated or specified otherwise. Access panels are not required in ceilings formed of removable acoustical panels.
- B. Access panels that are not fire-rated shall be Milcor or equal. Provide modular-sized access panels in inaccessible acoustic tile ceilings sized according to the tile size. Provide Milcor metal access panels with cam lock and mounting trim to match finish encountered. Provide natural anodized aluminum finish for panels in kitchens and toilets. Provide prime finished steel for panels in other areas. Paint panels in finished areas to match finish surface.
 - C. Where indicated and where access panels are installed in walls of shafts that are not sealed at each floor, access panels shall be Milcor or equal "Fire-Rated" and shall bear the Underwriters' Laboratories, Inc. Class B, 1-1/2 hour label. Openings shall be framed in accordance with the access panel manufacturer's recommendations. Frames shall be not lighter than 16-gage steel. Panels shall be not lighter than 20-gage steel and shall be insulated sandwich type. Panels shall have a continuous hinge, self-lubricating lock, a direct action-knurled knob, and an interior latch release mechanism.

2.09 CHARTS, DIAGRAMS, AND SCHEMES:

- A. Charts, diagrams, and schemes listed below shall be provided under each applicable section of the detailed mechanical specifications by the Contractor, framed under glass, and installed where shown on the drawings or directed in the field. All charts, diagrams, and schemes shall be complete, neat, clear, legible, and permanent.
- B. Electric sequence control diagrams of all mechanical system components.
- C. Automatic temperature control diagrams identified as to name, sequence of operation, location, function, temperature setting, spring range, and manufacturer's part number.
- D. Valve identification chart with typewritten schedule of all valves giving their tag number, description, system served, and normal operation position.
- E. Piping schemes where required by the detailed specifications.

2.10 CATALOG DATA FOR OWNER:

- A. Furnish one (1) bound copy of Catalog Data on each manufactured item of equipment used in the mechanical work, complete with index listing the products alphabetically by name, together with the names and addresses of manufacturers, sales, and service representatives. Furnish two (2) bound copies of Operating and Maintenance Instructions of each item of equipment. Catalog Data and Operating and

Maintenance Instructions shall be submitted to the Engineer for review prior to transmittal to the Owner.

2.11 RECORD OF AS-BUILTS AND CONDITIONS:

- A. Provide a complete set of prints of mechanical plans marked to indicate as-built conditions which are different from those shown on the original construction documents. Site as-built conditions which are different from the construction documents shall be dimensioned from building or identifiable marker. Accurate locations of all concealed utility lines, both interior and exterior shall be recorded. These drawings shall be delivered to the Architect/Engineer before being turned over to the Owner.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Coordination of Work:

1. The Contractor shall compare the mechanical drawings and specifications with the drawings and specifications of other trades, and shall report any discrepancies between them to the Architect/Engineer, and shall obtain from him written instructions for changes necessary in the mechanical work. The mechanical work shall be installed in cooperation with other trades installing interrelated work. Before installation, the Contractor shall make proper provision to avoid interferences in a manner approved by the Architect/Engineer. All changes required in the work of the Contractor caused by his neglect to do so shall be made by him at his own expense.
2. Anchor bolts, sleeves, inserts, and supports that may be required for the work shall be fully coordinated and compatible with the related equipment or materials. Locations shall be determined by the trade installing the related equipment or materials.
3. Slots, chases, openings, and recesses through floors, walls, ceilings, roofs, and partitions shall be located by the trades requiring them.
4. Locations of pipes, ducts, equipment, fixtures, etc., shall be adjusted to accommodate the work to interferences anticipated and encountered. The installing Contractors shall coordinate their work to the building structure and to other trades as directed by the General Contractor. No additional compensation or extension of completion time will be granted for extra work caused by a lack of coordination. The installing Contractor shall provide dimensions and locations of all openings, shafts, and similar items to the General Contractor for his coordination and execution. Work shall be installed as required so as not to

interfere with or delay the building construction. Pipes, ducts, etc., shall be concealed above ceilings, in walls, or in floors as applicable in all areas of the building except in equipment rooms, unfinished storage rooms, or other areas specifically noted to the contrary.

- a. Right-of-Way: Lines which pitch shall have right-of-way over those which do not pitch. For example, plumbing drains shall normally have right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.
 - b. Offsets, transitions, and changes in direction of pipes and ducts shall be made as required to maintain proper head room and pitch of sloping lines whether or not indicated on the drawings. The Contractor shall furnish and install all traps, drains, air vents, sanitary vents, etc., as required to affect these offsets, transitions, and changes in direction.
5. Exact locations of items such as diffusers, grilles, thermostats, hose bibbs, wall hydrants, and other similar items in finished areas of the building and on the exterior of the building shall be coordinated with each other, the building structure, and architectural features thereof so as to be aligned with or centered on other items as applicable. Locations indicated on the drawings are approximate. Trades shall coordinate their work with door swings, block coursing, tile arrangement, and other similar features before establishing the location of any components. Before any related work has begun, the Architect/Engineer may direct reasonable minor changes in equipment locations with no increase in contract price to the Owner. Thermostats shall be mounted so that the top of the thermostat is 48" above the floor and aligned with the top of the light switch plates and 8" from the light switch if shown on the drawings adjacent to a light switch. Room thermostat locations shall be coordinated with door swings, light switches and other wall mounted items. Corridor thermostats shall be mounted 60" above finished floor. Before roughing in conduit or pipe, verify the location of equipment to be connected.
6. Installation and Arrangement: The Contractor shall install all mechanical work to permit removal of coils, heat exchanger bundles, boiler tubes, fan shafts and wheels, filters, belt guards, sheaves and drives, and all other parts requiring periodic replacement or maintenance. The Contractor shall arrange pipes, ducts, and equipment to permit ready access to valves, cocks, traps, motors, control components, and to clear the openings of swinging and overhead doors and of access panels.
7. Ductwork: The Contractor shall change the cross-sectional dimensions of ductwork when required to meet job conditions but shall maintain at least the same equivalent cross-sectional area. The Contractor shall secure the approval of the Architect/Engineer prior to fabrication of ductwork requiring substantial

changes. Ductwork shall not be fabricated until coordination with available space.

8. Drawings by Contractor: When directed by the Architect/Engineer, the Contractor shall submit for review by Architect/Engineer drawings clearly showing certain portions of the mechanical work and its relation to the work of other trades before beginning shop fabrication or erection in the field.
9. Dimensions: The Contractor shall ensure that items to be furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections, and shall furnish and install such sizes and shapes of equipment that the final installation shall suite the true intent and meaning of the drawings and specifications. If he concludes that there is insufficient space for installation or specified materials, he shall immediately notify the Architect/Engineer of the conflict and shall stop affected work until he receives instructions as to how to proceed from the Architect/Engineer.
10. Damage to Work: The Contractor is responsible for damage caused by his work or workmen. Repairing of damaged work shall be done by the Contractor as directed by the Engineer at no additional cost.
11. The Contractor shall be responsible for any interruptions to existing services and shall repair any damages to existing systems caused by his operations.

B. Protection and Cleaning:

1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations. Damaged or defective items, in the opinion of the Architect/Engineer, shall be replaced.
2. All items subject to moisture damage (such as controls and electrical equipment) shall be stored in dry, heated spaces.
3. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water, chemical or mechanical injury. Clean mechanical equipment to remove dust, oil, dirt, plaster, mortar, trash, or paint. Piping, conduit, and ductwork shall be blown out or flushed of all foreign matter before wires are pulled in or before connections are made to equipment or systems. Clean each cooling tower in accordance with manufacturer's instructions before connecting to the system. Provide temporary filters for air units that are operated during construction. After all construction dirt has been removed from the building, install new filters in air units.

- C. Concrete and Grout: Use concrete and shrink compensating grout 3000 psi minimum.
- D. Install gages, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gages to be easily read by operator standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
- E. Work in Existing Buildings:
1. Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills will be permitted only with approval of the Architect/Engineer. Locate openings that will least effect structural slabs, columns, ribs or beams. Refer to the Architect/Engineer for determination of proper design for openings through structural sections and opening layouts approval, prior to cutting or drilling into structure. After Architect/Engineer's approval, carefully cut opening through construction not larger than is absolutely necessary for the required installation.
 2. Remove existing work as necessary to install new work. Except as otherwise shown or specified, do not cut, alter or remove any structural work or any ducts, plumbing, steam, gas or electric work without approval of Architect/Engineer. Existing work (walls, ceilings, partitions, floors, mechanical, and electrical work) disturbed or removed as a result of performing required new work shall be patched, repaired, reinstalled, replaced with new work, and refinished and left in as good condition as existed before commencing work. Existing work to be altered or extended that is found to be defective in any way shall be reported to the Architect/Engineer before it is disturbed. Materials and workmanship used in restoring work shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.
 3. Continuity of service shall be maintained to all existing systems, except for designated short intervals during which connections are to be made. Interruptions shall be coordinated with the Owner as to the time and duration.
 4. Upon completion of contract, deliver work complete and undamaged. Damage that is caused by Contractor or Contractor's workmen to existing structures, grounds, or utilities or to work done by others shall be repaired by Contractor and left in as good condition as existed prior to damaging.
 - a. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cable, etc., of utility services or of fire

protection system and communications systems (except telephone) which are not scheduled for discontinuance or abandonment.

- b. Restoration work required by damage to telephone systems shall be done by telephone company at Contractor's expense.

3.02 PIPING:

- A. Under each applicable section of the detailed mechanical specifications, the Contractor shall furnish and install as shown on the drawings or as necessary to complete the working system in accordance with the intent of the drawings and specifications, a complete system of piping, valves, supports, anchors, sleeves, and all other appurtenances. The piping drawings are diagrammatic and indicate the general location and connections. The piping may have to be offset, lowered, or raised as required or as directed at the site. This does not relieve the Contractor of responsibility for the proper erection of systems of piping in every respect suitable for the work intended as described in the specifications and as approved by the Architect/Engineer. Wherever two dissimilar metals join in any piping system, install a dielectric fitting at their intersection.
- B. Installation: Piping shall be properly supported and adequate provisions shall be made for expansion, contraction, slope, and anchorage without damage to joints or hangers. All piping shall be cut accurately for fabrication to measurements established at the construction site. Pipe shall be worked into place without springing and/or forcing, properly clearing all windows, doors, and other openings and equipment. Cutting or other weakening of the building structure to facilitate piping installation will not be permitted without written approval. Pipe extending through the roof shall be properly flashed. All changes in direction shall be made with fittings. Wherever pipe hanger bears directly on the pipe being supported, the hanger shall be of the same material as the pipe.
- C. Arrangement: All piping shall be arranged so as not to interfere with removal of other equipment or devices nor to block access to doors, windows, manholes, or other access openings. Piping shall be arranged so as to facilitate removal of tube bundles. Flanges or unions, as applicable for the type of piping specified, shall be provided in the piping at connections to all items of equipment. Piping shall be placed and installed so that there will be no interference with the installation of the equipment, ducts, etc. All piping shall be installed to ensure noiseless circulation. All piping shall be erected and pitched to ensure proper drainage. Piping shall be installed so as to avoid liquid or air pockets throughout the work. Pipe in finished areas shall be concealed. Exposed piping shall be installed in practical alignment with the building. All valves and specialties shall be placed to permit easy operation and access, and all valves shall be regulated, packed, and glands adjusted at the completion of the work before final acceptance. Water pipes shall not be installed in attic spaces, crawl spaces or similar areas which are subject to freezing, unless indicated to be heat traced.

3.03 PIPE AND EQUIPMENT SUPPORTS:

- A. Supports: The Contractor shall support plumb, rigid, and true to line all work and equipment furnished under each section of these specifications. The Contractor shall study thoroughly all general, structural, and mechanical drawings, shop drawings, and catalog data to determine how equipment, fixtures, piping, ductwork, etc., are to be supported, mounted, or suspended, and shall provide extra steel bolts, inserts, pipe stands, brackets and accessories for proper support, whether or not shown on the drawings. When directed, the Contractor shall submit drawings showing supports for review by the Architect/Engineer.
- B. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels. Drill or burn holes in structural steel only with the prior approval of the Architect/Engineer.
- C. Use of chain, wire or strap hangers; wood for blocking stays or bracing; or hangers suspended from piping above will not be permitted. If products are rusty, replace or thoroughly clean and coat with prime paint.
- D. Use hanger rods that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. Provide a minimum of 2-inch clearance between pipe or pipe covering and adjacent work.
- E. Horizontal Pipe Support Spacing:
 - 1. Cast Iron: Five feet on centers maximum spacing. At least one hanger on each full length of pipe, close to hub where possible and at least one within 24 inches of each fitting, and wherever else required to prevent tendency toward deflection due to load. Provide a hanger at upper angle at each drop. Locate hangers adjacent to hubs on multiple fittings not more than four feet on centers.
 - 2. For support spacing of all other horizontal piping, refer to MSS SP-69 and provide additional supports at valves, strainers, inline pumps and other heavy components. Provide a support within one foot of each elbow.
 - 3. Black Steel Gas Piping: 8 feet on centers maximum spacing for on-roof horizontal supports. Provide a support within one (1) foot of each elbow.
- F. Vertical Pipe Supports – HVAC and Gas:
 - 1. Vertical runs less than 15 feet long may be supported by the hangers on the connecting horizontal runs.

2. Up to 6-Inch Pipe, 60 Feet Long or Not Over 12-Inch Pipe Up to 30 Feet Long: Riser clamps bolted to pipe below couplings, or welded to pipe and resting securely on the building structure.
 3. Vertical pipe larger than the foregoing, support on base elbows or tees, or substantial pipe legs extending to the building structure.
- G. Connections: All piping connecting to equipment shall be installed without strain at the piping connection. The Contractor shall be required as directed to remove the bolts in flanged connections or to disconnect piping to demonstrate that piping has been so connected.
- H. Gas Piping Supports: Shall have electro-galvanized steel top with (aluminum roller) (polymeric) supports, the roller axle, fittings and other hardware shall be galvanized steel or polymeric material. Support base shall be secured to roof with adhesive roofing mastic. Roofing membrane shall be compatible with mastic. Consult manufacturer of existing roofing system if isolation pads are required between roof membrane and support base. Consult manufacturer of existing or new roofing system to verify appropriate adhesive to bond base to roofing surface. Do not use wood as support materials. (Support base shall be secured to roof with zinc-coated bolts to structure.)
- I. Gas Piping Anchors: Shall be bolted or field welded to piping. Anchors shall be attached with zinc-coated or galvanized bolts or field welded to angle iron attached to building structure and HVAC equipment curb.

3.04 MOTOR AND DRIVE ALIGNMENT:

- A. Belt Drive: Set driving and driven shafts parallel and align so that the corresponding grooves are in the same plane.
- B. Direct-Connect Drive: Securely mount motor in accurate alignment so that shafts are free from both angular and parallel misalignment when both motor and driven machine are operating at normal temperatures.

3.05 EXCAVATION AND TRENCHING:

- A. Under each applicable section of the detailed mechanical specifications, the Contractor shall perform all excavation of every description and of whatever substances encountered, to the depths indicated on the drawings or as otherwise specified. No extras will be allowed for rock unless indicated otherwise. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and wasted as indicated on the drawings or as directed by the Architect/Engineer. Such grading shall be done as may be necessary to prevent

surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved method. Such sheeting and shoring shall be done as may be necessary for the protection of the work and for the safety of personnel. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled if, in the opinion of the Architect/Engineer, the pipe or duct can be safely and properly installed and backfill can be properly tamped in such tunnel sections.

- B. Trench Excavations (Includes under building and 5 feet outside of building): Trenches shall be of necessary width for the proper laying of the pipe or duct, and the banks shall be as nearly vertical as practicable. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe or duct on undisturbed soil at every point along its entire length. Except where rock is encountered, care shall be taken not to excavate below the depths indicated. Where rock excavations are required, the rock shall be excavated to a minimum over depth of 4 inches below the trench depths indicated on the drawings or specified. Over-depths in the rock excavation and authorized over depths shall be backfilled with loose, granular, moist earth, thoroughly tamped. When corrosive material or unstable soil or material that is incapable of supporting the pipe is encountered in the bottom of the trench, the Contractor shall promptly notify the Architect/Engineer. Such unsuitable soil or material shall be removed to a depth as directed by Architect/Engineer and the trench backfilled to the proper grade with coarse sand, fine gravel, or other suitable backfill material, as directed by the Architect/Engineer.
- C. Sanitary Sewers, Storm Sewers, and Water Mains: The width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench shall be between 6 and 12 inches on either side of the pipe. The width of the trench above that level may be as wide as necessary for sheeting and bracing and the proper performance of the work. The bottom of the trench shall be rounded so that at least the bottom quadrant of the pipe shall rest firmly on undisturbed soil for as much of the full length of the barrel as proper jointing operations will permit. This part of the excavation shall be done manually only a few feet in advance of the pipe laying by men skilled in this type of work.
- D. Protection of Existing Utilities: Existing utility lines to be retained that are shown on the drawings or the locations of which are made known to the Contractor prior to excavation, as well as all utility lines uncovered during excavation operations, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired by the Contractor, at his expense.

3.06 BACKFILLING OF TRENCHES:

- A. Trenches shall not be backfilled until all required pressure and other tests and inspections have been performed and until the utilities systems as installed conform to the requirements of the drawings and specifications. Trenches for piping or duct shall be carefully backfilled with materials consisting of earth, loam, sandy clay, sand and

gravel, soft shale, or other approved materials saved from the excavation or borrowed as required. The backfill materials shall be granular in nature and shall not contain coal, dust, cinders, ashes, roots, sod, rubbish, corrosive materials, large clods of earth, or stones over 2-inch maximum dimension. The Architect/Engineer may reject any on-site or borrowed materials which he considers unsuitable for the intended use of the fill.

- B. Controlled compacted backfill shall be used under slabs-on-grade, building structure, concrete paving, asphaltic concrete paving, driveway, parking areas, and other areas so specified or indicated on the drawings. All backfill required to raise the surface to the desired subgrade shall be continuously controlled and placed in maximum of 8-inch loosely placed lifts and compacted to 100 percent maximum dry density beneath the building and 95 percent under all paved drives and parking areas in accordance with ASTM D 698 (Standard Proctor). The soils engineer shall check each lift and submit reports to the Architect/Engineer in accordance with Section, Earthwork.
- C. Normal Backfill: Where controlled compacted backfill is not required, such as grassed areas, the trenches shall be carefully backfilled with material in eight-inch layers and thoroughly and carefully rammed until cover is not less than one foot. The remainder of the backfill material shall then be carefully placed in the trench in one-foot layers and tamped. The surface shall be graded to a reasonable uniformity and the mounding over trenches left in a uniform and neat condition as approved by the Architect/Engineer.
- D. Test for Displacement of Sewers: Storm and sanitary sewer mains shall be checked by the Contractor to determine whether any displacement of the pipe has occurred after the trench has been backfilled to two feet or more above the pipe. A light shall be flashed between manhole locations and through each straight section of pipe. If the illuminated interior of the pipeline shows poor alignment, displaced pipe, or any other defects, in the opinion of the Architect/Engineer, such defects shall be remedied by the Contractor at his expense.
- E. Plants, turf, and surfacing that are to remain in the area of the excavation shall be carefully removed and placed where they will not be damaged. After the excavations are filled, the plants, turf, and surfacing shall be replaced as directed. Provide repairs for sidewalks, driveways, and other cement and asphalt surfaces which are damaged during excavating to match the adjacent work in material and finish.

3.07 CUTTING AND PATCHING:

- A. The Contractor shall be responsible for all required digging, cutting, etc., incident to the work, and shall thereafter make all required repairs necessary to restore the cut structure or material to the condition existing prior to the cutting. In no case shall the Contractor cut into any major structural element, beam, or column without the written approval of the Architect/Engineer. All cutting, patching, repairing, or replacing of

work required because of fault, error, tardiness, or damage by any trade shall be performed with no increase in the contract price to the Owner.

- B. Patch and repair roof in accordance with requirements of existing roof warranties and manufacturer's standard approved details.

3.08 LUBRICATION:

- A. Under each applicable section of the detailed mechanical specifications, the Contractor shall provide all oil and grease required for the operation of all equipment until acceptance by the Owner. The type and application of all lubricants shall conform to the recommendations of the manufacturer of the equipment involved. The Contractor shall be held responsible for all damage to bearings while the equipment is being operated by him up to the date of acceptance of the project. This Contractor shall be required to protect all bearings during installation and shall thoroughly grease or otherwise protect steel shafts and other bare ferrous parts to prevent corrosion. All equipment shall be provided with covers as necessary for proper protection against damage or deterioration during construction.

3.09 OPERATING AND PERFORMANCE TESTS:

- A. Prior to the final inspection, perform required tests as specified in Section 23 05 93, TESTING, ADJUSTING AND BALANCING FOR HVAC, and submit the test reports and records to the Architect/Engineer.
- B. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Owner.
- C. When completion of certain work or system occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then make performance tests for heating systems and for cooling systems respectively during first actual seasonal use of respective systems following completion of the work.

3.10 QUIET OPERATION AND VIBRATION:

- A. Systems shall operate under conditions of load without unusual or excessive noise or vibration. Unusual or excessive noise or vibration shall be corrected.

3.11 INSTRUCTIONS TO OWNER'S PERSONNEL:

- A. Under each applicable section of the detailed mechanical specifications, the Contractor shall instruct the representative of the Owner in the proper operation and maintenance of all elements of the mechanical systems. A competent representative of the Contractor shall spend not less than two days in such formal instruction and

shall spend such additional time as directed by the Architect/Engineer to fully prepare the Owner to operate and maintain the mechanical systems. The Contractor shall provide letter of instruction upon completion to the Architect/Engineer stating the date of instruction and the names of those in attendance.

3.12 GUARANTEE:

- A. All mechanical equipment, materials, and labor required by the contract documents for this project shall be guaranteed to be free of defective materials or workmanship for a period of one year after final acceptance of the project. Defects in equipment, materials, or workmanship occurring during this period shall be corrected with new equipment and materials or additional labor at no cost to the Owner.

3.13 SITE VISIT REPORT:

- A. Answer in writing each item of discrepancy noted on all site visit reports.

3.14 DEMOLITION:

- A. Contractor shall visit the site before bidding to determine the extent and location of demolition to be performed.
- B. Contractor to remove all pipes, ducts, equipment, controls, etc. not required, reused or needed for reconnecting to the new systems. All items not required for the new system shall be removed.
- C. The Owner shall select and retain such existing items indicated or required to be removed as he desires. Items selected by the Owner to be retained shall be removed and relocated to an Owner designated location by the Contractor.
- D. All equipment, piping, ductwork, conduit, etc. to remain and be reused shall be protected from damage. Any damage to existing material shall be repaired to original condition.
- E. Coordinate all demolition activities with the phasing of construction. Demolition shall not affect operations of the building.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 CONDITIONS:

- A. The applicable provisions of Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) are hereby made a part of this section, and the Contractor is cautioned to read Section 23 00 00 carefully as items of work applicable to this section are included in Section 23 00 00.

1.02 DESCRIPTION OF WORK:

- A. Testing, adjusting, and balancing (TAB) of heating, ventilating and air conditioning (HVAC) systems.
- B. The Contractor shall provide all labor, materials, instruments, equipment and service and shall perform all operations required for testing, adjusting, and balancing of systems and related work to obtain the performance of the systems as shown on the drawings and in the specifications.
- C. Definitions:
 - 1. Basic TAB terms used in this section: "Testing, Adjusting and Balancing" of ASHRAE Handbook, latest edition.
 - 2. TAB: Testing, adjusting and balancing. The process of checking and adjusting HVAC systems to meet design objectives.
 - 3. AABA: Associated Air Balance Council.
 - 4. NEBB: National Environmental Balancing Bureau.
 - 5. Hydronic Systems: Includes heating water and chilled water (HVAC).
 - 6. Air Systems: Includes all supply air, return air, exhaust air and outside air systems.

1.03 RELATED WORK:

- A. Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC).

B. Section 23 20 00, HVAC PIPING AND PUMPS.

C. Section 23 65 00, COOLING TOWERS.

1.04 QUALITY ASSURANCE:

- A. TAB Agency Qualifications: The Contractor shall provide the services of a firm certified by the Associated Air Balancing Council, or the National Environment Balancing Bureau to adjust and balance all heating, ventilating, air conditioning, and exhaust systems. All personnel involved in the execution of the work shall be experienced in the balancing of mechanical systems. The firm shall not be the installer of the systems to be tested and shall be otherwise independent of the project.
- B. Performance Criteria: Work shall be performed in accordance with the approved TAB Agenda.
- C. Test Equipment Criteria: The basic instrumentation requirements and accuracy/calibration required by AABC (Section Two) or Section II of the NEBB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.
- D. Guarantee: The AABC or NEBB certified firm shall guarantee that all testing, adjusting and balancing work shall be performed in accordance with NEBB standards and procedures and shall provide evidence of their certification for the Architect/Engineer.

1.05 SUBMITTALS:

- A. In accordance with Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) General Requirements, furnish the following:
 - 1. TAB Agency qualifications, submit name and qualifications of job supervisor.
 - 2. Upon approval of TAB Agency, submit TAB AGENDA for approval.
 - 3. After completion of tests, the Contractor shall submit three copies of complete test reports for approval. Applicable NEBB or AABC reporting forms shall be used. Where test results differ from specified design conditions, indicating a contract deficiency, include explanatory comments in report. The Contractor shall submit final reports prior to requesting the final inspection for the project.
 - 4. Approved copy of report shall be bound in Operations and Maintenance Manuals; see Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) General Requirements.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. The TAB agency shall be responsible for all items or materials necessary for connection of its instrumentation to the ductwork, piping or equipment. Do not proceed with testing, adjusting, and balancing work until systems are complete and operational.

PART 3 - EXECUTION

3.01 GENERAL:

- A. The General Contractor shall furnish a complete set of HVAC drawings and specifications to the TAB agency. The agency shall review plans and specifications prior to systems installation and submit a written report indicating deficiencies in the system that would preclude the proper adjusting, balancing, and testing of the system. The HVAC system shall be complete and fully operational with clean clean pipe strainers prior to system balancing. The TAB agency shall review the installed system for proper installation of testing, adjusting, and balancing equipment and submit a written report indicating system conditions. The Mechanical Contractor shall provide support through factory representatives, equipment mechanics, and control technicians to work with the balancing organization to adjust equipment and controls to obtain design performance.
- B. Allow sufficient time in construction schedule for TAB prior to final inspection for the project.
- C. One week before the final site visit, the balancing organization shall provide the Architect/Engineer with three (3) typed copies of balance reports, in format recommended by NEBB. The report shall contain the following:
 - 1. Project name, location, contractors names, balancing organizations' name, and date.
 - 2. Balancing organizations' certification and individual certified qualifications of persons responsible for supervising and performing the actual work.
 - 3. Brief description of balancing instruments used for this project and their latest calibration performance.
 - 4. Weather conditions at the beginning and end of each day to include; outside dry bulb and wet bulb temperatures, general weather description and cloud cover.

5. System data for each unit:

- a. Installation data as applicable; mark, location, manufacturer, model, size, arrangement, motor HP, voltage, phase, and full load amps.
- b. Design quantities and balance readings taken during the balancing operation indicating the quantity measured on the first reading, and the final, balanced, measured quantity for air and hydronic balance.

3.02 HYDRONIC BALANCE:

- A. Perform final hydronic balance after all systems have been flushed, cleaned, and filled.
- B. Hydronic balance includes performance readings on all pumps, coils, heat exchangers, and flow measuring devices. Adjust pump flows to actual system heads by adjustment of balancing valves. Flow measuring devices take precedence over pump head readings. Record discrepancies for evaluation. The drive motors shall not be loaded over the corrected full load amperage rating of the motor involved.
- C. Report pressure drop readings across all major system components both for flow determination and deviations between actual and design values.
- D. Record on flow diagrams the flows obtained in each of the various circuits and modes of operation. Designate the manual rebalancing effort that is necessary for optimum operations. Measure flows in primary and secondary pumping systems when operating independently and jointly. Measure and record flows and power consumption of variable flow systems at maximum flow conditions and in increments of 10 percent reductions to a minimum system condition.
- E. Report the hydronic balance readings for the following as further specified in 3.01.G:
 1. Cooling Tower - Water supply and return temperatures and water flow (gpm)
 2. Pumps - Water flow (gpm), suction and discharge pressures, operating head, and full load amps.

3.03 TEMPERATURE CONTROL TEST:

- A. After the heating, ventilating and air conditioning systems have been adjusted and balanced completely, a six hour test shall be run to determine whether the systems are responding to the temperature controls.

- B. Test Verification - The TAB agency shall attest by letter that all equipment has been wired and tested to see that the indicated sequence of motor control is established, that all safety controls function properly, that all motor protective devices are sized correctly, and that the systems are operating at the points set on the controls.
- C. Control Setting - During the performance tests, control settings may require adjustment and if so, shall be adjusted to produce the best balanced system operation. The final setting of each operating and safety control shall be recorded. This shall include but not be limited to thermostats, limit controls, damper position switches, smokestats, firestats, freezestats, aquastats, and other similar items.
- D. Marking of settings - Upon completion of system balancing the settings of adjustment devices including valves and dampers shall be permanently marked. Do not mark room mounted thermostats.

END OF SECTION

SECTION 23 07 00

HVAC INSULATION

PART 1: GENERAL

1.01 CONDITIONS:

- A. The applicable provisions of Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) General Requirements, are hereby made a part of this section, and the Contractor is cautioned to read Section 23 00 00 carefully as items of work applicable to this section are included in Section 23 00 00.

1.02 DESCRIPTION OF WORK:

- A. The work to be performed under this section of the specifications comprises the furnishing of all labor and materials and the completion of all work of this section as shown on the drawings and/or herein specified.
- B. Insulation materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work.
- C. In general, the work included under this section consists of, but is not limited to, the following:
 - 1. Field applied insulation for thermal efficiency and condensation control for HVAC and plumbing piping, ductwork and equipment.

1.03 RELATED WORK:

- A. Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC).
- B. Section 23 20 00, HVAC PIPING AND PUMPS.
- C. Section 23 30 00, HVAC AIR DISTRIBUTION.
- D. Section 23 34 00, HVAC FANS.
- E. Section 23 50 00, CENTRAL HEATING EQUIPMENT.
- F. Section 23 64 00, PACKAGED WATER CHILLERS.
- G. Section 23 65 00, COOLING TOWERS.

- H. Section 23 70 00, CENTRAL HVAC EQUIPMENT.
- I. Section 23 81 00, DECENTRALIZED UNITARY HVAC EQUIPMENT.
- J. Section 23 82 00, CONVECTION HEATING AND COOLING UNITS.

1.04 SUBMITTALS:

- A. In accordance with Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) General Requirements, furnish the following:
 - 1. Manufacturer's Literature and Dimension Cuts:
 - a. Insulation Materials: Each type used. State surface burning characteristics and thermal properties.
 - b. Insulation Facings and Jackets: Each type used. State vapor barrier properties. State that white finish will be furnished for exposed pipe, ductwork, casings, and equipment.
 - c. Insulation Accessory Materials: Each type used.
 - d. Manufacturer's installation and fitting fabrication instructions for elastomeric unicellular insulation.
 - e. Make reference to applicable specification paragraph numbers for coordination.

1.05 DEFINITIONS:

- A. Air Conditioned Space: Space directly supplied with cooled air.
- B. Cold: Equipment, ductwork or piping handling media at design temperature of 60 Deg. F. or below.
- C. Hot: Ductwork handling air at design temperature above 60 Deg. F.; equipment or piping handling media above 105 Deg. F.
- D. PCF: Density, pounds per cubic foot.
- E. VOC's: Volatile Organic Compounds
- F. Runout: Branch pipe connection up to one inch nominal size and not over 12 feet in length to a floor mounted or ceiling mounted terminal unit.

- G. Thermal Conductance: Heat flow rate through materials.
 - 1. Flat Surface: BTU per hour per square foot.
 - 2. Pipe or Cylinder: BTU per hour per linear foot.
- H. Thermal Conductivity (k): $(\text{BTU} \cdot \text{in thickness})/(\text{hr} \cdot \text{ft}^2 \cdot ^\circ\text{F temperature difference})$.
- I. Outside: Open to view beyond the exterior side of walls, above the roof and unexcavated or crawl spaces, above or beneath pier floors, in tunnels or exposed on all sides in trenches connected or not connected to an exterior portion of a building.
- J. Finished Spaces: Spaces used for habitation or occupancy where rough surfaces are plastered, paneled, or otherwise treated to provide a pleasing appearance.
- K. Unfinished Spaces: Spaces used for storage or work areas where appearance is not a factor, unexcavated spaces, crawl spaces, etc.
- L. Concealed Spaces: Spaces between a ceiling and floor construction above or between double walls or furred-in areas, pipe and duct shafts, etc.
- M. Exposed: Open to view inside the building. For example, pipe run through a room, and not covered by other construction, is exposed.

PART 2: PRODUCTS

2.01 GENERAL:

- A. Building characteristics of insulation materials shall comply with NFPA 90A, pertinent parts of which are noted as follows:
 - 1. Duct coverings, duct linings, vapor barrier facings, tapes, and core materials in panels used in duct systems shall have a flame spread rating not over 25 without evidence of continued progressive combustion and a smoke developed rating not higher than 50. If coverings and linings are to be applied with adhesives, they shall be tested as applied with such adhesives, or the adhesives used shall have a flame spread rating not over 25 and a smoke developed rating no higher than 50 when in the final dry state.
 - 2. Duct coverings and linings shall not flame, glow, smolder, or smoke when tested in accordance with ASTM C 411 at the temperature to which it is exposed in service. In no case shall the test temperature be below 250 Deg. F.

3. Pipe insulation and coverings shall meet the requirements of 2-3.3.1 and 2-3.3.2 when installed in ducts, plenums, or concealed spaces used as part of the air distribution system.
 4. In addition to NFPA, the insulation material shall not transform into a molten flaming liquid during combustion as characterized by some polyethylenes.
- B. Test Methods: ASTM E 84, UL 723, or NFPA 255.
- C. Insulation shall be Johns Manville, Owens Corning, Pittsburg Corning, or Armacell. Trade names are used herein, unless indicated otherwise, to establish a standard of quality.
- D. Specified k factors are at 75 Deg. F. mean temperature unless stated otherwise. Where optional insulation material is used, select thickness to provide thermal conductance no greater than that for the specified material. For pipe, use insulation manufacturer's published heat flow tables. For a flat surface, thermal conductance equal thermal conductivity (k) divided by the thickness of the insulation. For runout insulation and condensation control insulation, no thickness adjustment need be made.
- E. All materials shall be compatible and suitable for service temperature and shall not contribute to corrosion or otherwise attack surfaces to which applied in either the wet or dry state.
- F. Underwriters' Laboratories, Inc. label or listing, or satisfactory certified test report from an approved testing laboratory will be required to show that surface burning characteristics for materials to be used do not exceed specified ratings.
- G. All sealants and adhesives must comply with all applicable South Coast Air Quality Management District (SCAQMD) VOC limits including but not limited to Rule #1168. All mastics and coatings must comply with all applicable Green Seal GS-11 VOC limits.

2.02 FACINGS AND JACKETS:

- A. Fed. Spec. HH-B-100 for Vapor Barrier Types I and II:
1. Puncture Test Method: ASTM D 781.
 2. Type I, Low Vapor Transmission (0.02 Perm Rating), Beach Puncture 50 Units: For insulating facing on exposed ductwork, casings, and equipment, and for all pipe insulation jackets. Facings and jackets shall be white all service type (ASJ) suitable for painting without priming.

3. Type II, Medium Vapor Transmission, Beach Puncture 25 Units: Foil-Scrim-Kraft (FSK) type for concealed ductwork and equipment.
4. Factory composite materials may be used provided they have been tested and certified by the manufacturer to meet Beach puncture units specified above.
5. Fire and smoke treatment of jackets and facings shall be permanent. The use of water soluble treatments is not acceptable.
6. Pipe insulation jackets shall have 1-1/2 inch minimum lap at longitudinal joints and not less than 3-inch butt strips at end joints. Facing on board, blanket and block insulation shall have 2-inch laps or 3-inch minimum butt strips. Butt strip material shall be the same as the jacket or facing. Laps and butt strips may be self-sealing type with factory applied pressure sensitive adhesive.

2.03 MINERAL FIBER INSULATION:

- A. Owens-Corning Faced Duct Wrap Fiberglass Insulation - FRK Type 100, ASTM C 553-92 (Blanket, Flexible), Density 1 pcf, $k = 0.31$, for temperatures up to 250 Deg. F.
 1. Concealed supply air ductwork within building's thermal envelope shall be 1-1/2 inch thick insulation.
 2. Concealed outdoor air ductwork within building's thermal envelope shall be 2-inch thick insulation.
 3. Concealed supply air ductwork outside building's thermal envelope shall be 2-inch thick insulation.
 4. Concealed return air ductwork within building's thermal envelope need not be insulated.
 5. Concealed return air ductwork outside building's thermal envelope shall be 2-inch thick insulation.
 6. Concealed exhaust air ductwork within building's thermal envelope and within 10 feet of connection to outdoors shall be 1-1/2 inch thick insulation.
 7. Concealed exhaust air ductwork outside building's thermal envelope shall be 1-1/2 inch thick insulation.
 8. Concealed ductwork with acoustic lining within the building's thermal envelope need not be insulated.

9. Concealed ductwork with acoustic lining outside building's thermal envelope shall be 1-1/2 inch thick insulation.
- B. Owens-Corning 705 Rigid Board Fiberglass Insulation, ASTM 612, 6 pcf density, with white laminated kraft-aluminum foil reinforced all-service vapor barrier facing.
1. Exposed outside air ductwork shall be 2-inch thick insulation.
 2. Exposed supply air ductwork shall be 1-1/2 inch thick insulation.
 3. Exposed return air ductwork and exhaust air ductwork in non-air conditioned spaces shall be 1-1/2 inch thick insulation.
 4. Exposed ductwork with acoustic lining need not be insulated.
- C. Owens-Corning Fiberglass SSL II ASJ Heavy Density Sectional Pipe Insulation, Fed. Spec. HH-I-558, Form D, Type III (Molded), Class 12, k = 0.24.
- D. Molded pipe fitting covering: Fed. Spec. HH-I-558, Form E. Class 16, k = 0.26, for temperatures up to 370 Deg. F.
- E. Insulation thickness and type for various piping systems shall be as indicated in the following table (Pipe Size/Insulation Thickness).

PIPE SIZE/INSULATION THICKNESS(1)

System	Temp. Range (°F)	Less than 1"	1" to 1-1/4"	1-1/2" to 3"	4" to 6"	8" & Up	Ins. Type (4)
High Pressure Steam	351-450	4.5	5.0	5.0	5.0	5.0	A
Medium Pressure Steam	251-350	3.0	4.0	4.5	4.5	4.5	A
Low Pressure Steam	201-250	2.5	2.5	2.5	3.0	3.0	A
Heating Water	140-200	1.5	1.5	2.0	2.0	2.0	A
Domestic							

Hot Water	90-159	1.5	1.5	2.0	2.0	2.0	A
Misc.	80-89	1.0	1.0	1.0	1.0	1.0	A,B
Domestic Cold Water	56-79	1.0	1.0	1.0	1.0	1.0	A
Chilled Water	40-55	1.0	1.0	1.5	1.5	2.0	A
Condensate Drain	45-75	0.5	0.5	1.0	1.0	1.0	A,B
Refrig./ Brine	Below 40 (6)	1.0	1.0	1.5	1.5	1.5	B
Steam Condensate	Any	1.5	1.5	2.0	2.0	2.0	A
Horizontal Soil (2)	Any	---	---	1.0	1.5		A
Horizontal Storm (3)	Any	---	---	1.0	1.5		A

NOTES:

- (1) Minimum thickness for insulation listed in preceding table is based on Thermal Conductivity, 'k' not exceeding 0.27 Btu per inch/hr. x sq. ft. x Deg. F. based on Mean Temperature of 75 Deg. F. Insulation with greater Thermal Conductivity shall have increased thickness to provide same performance characteristics as specified.
- (2) All horizontal sanitary piping above Kitchen or Dining Area only.
- (3) All horizontal storm piping above lowest floor including roof drains from underside of deck to just below fitting at top of vertical portion of stack. Fittings at top and bottom of vertical sections of horizontal offsets shall be insulated. Lap joints, tape and seal.
- (4) A - Fiberglass type insulation; B - Elastomeric type insulation.
- (5) Runouts to individual terminal units (not exceeding 12 ft. in length).
- (6) Also insulate all refrigerant pipes located in hot spaces such as attics.

2.04 ELASTOMERIC INSULATION:

- A. Armstrong Armaflex II Pipe Insulation, Fed. Spec. HH-I-573 and HH-I-1751/2, k = 0.27, flame spread not over 25, smoke developed not over 50 (1/2-inch thick test material), for temperatures from minus 40 Deg. F. to 211 Deg. F. No jacket required.

2.05 CELLULAR GLASS INSULATION:

- A. Pittsburgh Corning Foamglas Insulation, ASTM C 552, Type II, class 2, 8.5 pcf, closed cell rigid type.
 - 1. Buried steam piping, not in conduit, shall have 2 inch thick insulation.
 - 2. Buried pumped condensate piping, not in conduit, shall have 1 inch thick insulation.
 - 3. Outside piping shall have insulation thickness as indicated in table or as indicated on drawing. Protect with aluminum jacket.

2.06 CALCIUM SILICATE:

- A. Hot water heater storage tanks shall be insulated with IIG/Johns Manville hydrous calcium silicate block insulation, 1-1/2" thick, with edges tightly butted and secured with galvanized steel bands 12" on centers. Finish shall be 1/2" thick coat of insulating cement troweled over chicken wire and 1/2" thick coat of hard finish cement, troweled smooth.

2.07 ACCESSORY MATERIALS:

- A. Insulation inserts at pipe supports:
 - 1. Material: Cellular glass or calcium silicate 1/2 section of insulation, same thickness as adjacent insulation.
 - 2. Provide inserts for all insulated piping greater than 1-1/2 inch diameter. Install with metal insulation shields furnished with pipe supports, Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) General Requirements. Minimum insert length: 10 inches for up to 3 inch pipe, 12 inches for 3 to 6 inch pipe, 16 inches for 8 to 10 inch pipe, and 22 inches for pipe 12 inches and larger.
- B. Adhesives, Mastics, Cement:
 - 1. Mil. Spec. MIL-A-3316B, Class 1: Jacket and lap adhesive and protective finish coating for insulation.

2. Mil. Spec. MIL-A-3316B, Class 2: Adhesive for laps for adhering insulation to metal surfaces.
3. Mil. Spec. MIL-A-24179A, Type II, Class 1: Adhesive for installing flexible unicellular insulation and for laps and general use.
4. Mil. Spec. MIL-B-19565B, Type 1 or Type II and be listed on Qualified Products Database (QPD): Vapor barrier compound for outdoor use.
5. Fed. Spec. SS-C-160A, Type IIIB, (ASTM C 449): Mineral fiber hydraulic-setting thermal insulating and finishing cement.
6. Other: Insulation manufacturer's published recommendations.

C. Mechanical Fasteners:

1. Pins, Anchors: Welded pins, or metal or nylon anchors with tin-coated or fiber washer, or clips. Pin diameter shall be as recommended by the insulation manufacturer.
2. Staples: Outward clinching monel or stainless steel.
3. Wire: 18 gage soft annealed galvanized, or 14 gage copper clad steel or nickel copper alloy.
4. Bands: 3/4-inch nominal width, brass, aluminum or stainless steel.

D. Reinforcement and Finishes:

1. Glass Fabric, Open Weave: ASTM D 1668, Type III (resin treated) and Type 1 (asphalt treated).
2. Glass Fiber Fitting Tape: Mil. Spec. MIL-C-20070, Type II, Class 1.
3. Tape for Flexible Unicellular Insulation: Scotch No. 472, Nashua PE-12, or approved equal recommended by the insulation manufacturer.
4. PVC Fitting Cover: Fed. Spec. L-P-535D, Composition A, Type II, Grade GU, with Form B mineral fiber insert, for media temperature 45 Deg. F. to 250 Deg. F. Below 45 Deg. F. and above 250 Deg. F., provide double layer insert. Provide color matching, vapor barrier, pressure sensitive tape.

E. Firestopping Material: Refer to Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC).

2.08 METAL JACKETS:

- A. Aluminum jackets shall be ASTM B 209, temper H14, 0.016-inch thick, smooth. Secure jackets in place with aluminum or stainless steel bands and screws.
- B. Fittings in Outdoor Locations: Finish elbows and fittings with factory-fabricated metal covers. Covers shall be same thickness and materials as jackets on adjacent piping. Secure metal covers in place with metal bands and seal with a waterproof coating. Protect fittings with a weatherproof coating prior to installation of metal covers.
- C. Protect pipe and fittings with a vapor barrier mastic prior to installation of metal covers.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Required pressure tests of joints and connections shall be completed before application of insulation. Surface shall be clean and dry with all foreign materials, such as dirt, oil, loose scale, and rust removed.
- B. Insulation materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work. If any insulation material has become wet because of transit or job site exposure to moisture or water, the Contractor shall not install such material, and shall remove it from the job site. No insulation material shall be installed that has become damaged in any way. The Contractor shall also use necessary means to protect his work and materials.
- C. Except for specific exceptions, insulate entire specified equipment, piping, and duct systems. Insulate each pipe and duct individually. Do not use scrap pieces of insulation where a full length section will fit.
- D. Insulation materials shall be installed in a first class manner with smooth and even surfaces, with jackets and facings drawn tight and smoothly cemented down at all laps. Insulation shall be continuous through all sleeves and openings, except at fire dampers and duct heaters (NFPA 90A). Vapor barriers shall be continuous and uninterrupted throughout systems with operating temperature 60 Deg. F. and below. Lap and seal vapor barrier over ends and exposed edges of insulation. Anchors, supports, and other metal projections through insulation on cold surfaces shall be insulated and vapor sealed for a minimum length of six inches.
- E. Insulation on hot piping and equipment shall be terminated square or beveled with insulating cement, covered with jacket, at items not to be insulated, access openings and nameplates.

- F. On cold systems, vapor barrier performance is extremely important. Particular care must be given to vapor sealing the fitting cover or finish to the insulation vapor barrier. All penetrations of the jacket and exposed ends of insulation must be sealed with vapor barrier mastic. All valve stems must be sealed with caulking which allows free movement of the stem but provides a seal against moisture incursion.
- G. HVAC Work Not To Be Insulated:
 - 1. Internally insulated ductwork and air handling units.
 - 2. Equipment: Heating water pumps, expansion tanks.
 - 3. In Hot Piping: Unions, flexible connectors, control valves and discharge vent piping.
 - 4. Factory insulated flexible ducts.
 - 5. Factory insulated supply air diffusers.
- H. Plumbing Work Not To Be Insulated:
 - 1. Piping and valves of fire protection system.
 - 2. Chromium plated brass piping (except hot water and drain piping under handicapped lavatories).
 - 3. Domestic Hot Water: Unions, flexible connectors, control valves, expansion tank, pump.
- I. Apply insulation materials subject to the manufacturer's recommended temperature limits. Apply adhesives, mastics and coatings at the manufacturer's recommended minimum coverage.

3.02 INSTALLATION:

A. Flexible Mineral Fiber Blanket:

- 1. Adhere insulation to metal with 4-inch wide strips of insulation bonding adhesive at 8 inches on center. Additionally secure insulation to bottom of ducts exceeding 24 inches in width with pins welded or adhered 18 inches on centers. Secure washers on pins. Butt insulation edges and seal joints with laps and butt strips. Staples may be used to assist in securing insulation. Seal all vapor barrier penetrations with vapor barrier mastic. Sagging duct insulation will not be acceptable.

2. Supply air ductwork to be insulated includes main and branch ducts from fan discharge to room supply outlets and the bodies of ceiling outlets to prevent condensation. To prevent condensation, insulate trapeze type supports and angle iron hangers for flat oval ducts.

B. Molded Mineral Fiber Pipe and Tubing Covering:

1. Fit insulation to pipe aligning longitudinal joints. Seal longitudinal joint laps and circumferential butt strips by rubbing hard with a nylon sealing tool to assure a positive seal. Staples may be used to assist in securing insulation. Seal all vapor barrier penetrations with vapor barrier mastic. Provide inserts and install with metal insulation shields at outside pipe supports.
2. Fittings, Flange and Valve Insulation:
 - a. Fiberglass Pipe insulation shall be installed with joints butted firmly together. Valves and devices requiring access shall be insulation with mitered sections of insulation equal in thermal resistance and thickness to the adjoining insulation. Fittings shall be covered with Schuller "Zeston" type, pre-molded PVC fitting covers. Jackets on pipe insulation shall be stapled using outward clinching type staples spaced 3" apart at least 1/4" from the lap edge on systems operating at 80 Deg. F. and above; below 80 Deg. F. the laps are to be vapor sealed using self-sealing lap, lap seal gun, or adhesive. All insulation elbows, fittings, flanges, joints, laps, voids, punctures, and end tapers shall be sealed with two coats of Foster Vapor Out 30-33 or Childers Chil Out CP-33 vapor barrier mastic and reinforcing mesh (total 35 mils or 0.9 mm dry film thickness) regardless of service and before Zeston covers are applied.
 - b. Fitting tape shall extend over the adjacent pipe insulation and overlap on itself at least two inches.

C. Elastomeric Insulation:

1. Apply insulation and fabricate fittings in accordance with the manufacturer's installation instructions.
2. Pipe and Tubing Insulation:
 - a. Use proper size material. Do not stretch or strain insulation.
 - b. To avoid undue compression of insulation, provide inserts at supports as recommended by the insulation manufacturer. Insulation shields are provided under Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC).

- c. Elastomeric insulation shall be slipped on the pipe prior to connection wherever possible. Pipe leak tests shall be performed prior to the insulation of fittings. Where the slip-on technique is not possible longitudinal slit insulation shall be snapped on the pipe. All seams, voids, and butt joints shall be sealed with a Foster 85-75 or Childers CP-82 vapor barrier adhesive or taped with 1-1/2 inch wide 3M #471 tape.
 - d. Fittings and valves shall be insulated with mitered sections of insulation. All joints shall be secured and sealed with vapor barrier adhesive. Approved factory-made fittings such as F & D Mfg. and Supply Co. may be used.
- 3. On exterior refrigerant suction piping, provide two coats of Armstrong Armaflex Finish (vinyl lacquer) or Foster 30-64 on the insulation.
- D. Rigid Mineral Fiber Board: Secure rigid insulation by impaling over pins or anchors located not more than 3 inches from edge of boards and spaced not more than 18-inch centers and secured with washers and clips. Spot-weld anchor pins or attach with a Foster 85-60 or Childers CP-127 adhesive especially designed for use on metal surfaces. Apply insulation with joints tightly butted. Where vapor barrier is specified, all joints, breaks, seams, punctures, and voids shall be filled with vapor barrier mastic and covered with vapor seal material identical to that surrounding. Neatly bevel insulation around name plates and access plates and doors. Each pin or anchor shall be capable of supporting a 20-pound load. Protruding ends of clips shall be cut off flush after clips are secured and sealed with aluminum backed pressure sensitive tape and coated with vapor barrier mastic.
- E. Duct-mounted heating coils and variable air volume terminal box heating coils shall be insulated with external duct insulation as specified for cold systems. Where adjacent duct or unit is internally lined, extend external insulation minimum 2" onto adjacent item. Completely vapor seal insulation around coil and seal to adjacent surface.
- F. Hot piping serving heating coils located downstream from cooling coils including remote duct-mounted coils, coils at terminal units, etc., shall be insulated a minimum of 5 feet from the coil connection as specified for cold piping. All valves, flanges, unions, flexible connections, etc., within the insulated length shall also be insulated.
- G. Kitchen Hood: Kitchen exhaust ducts carrying grease-laden air shall be insulated with Flameshield Blanket (FSB) fire proofing as manufactured by ETS Schaefer or equal. Insulation shall be 6 pounds per cubic foot density and 1-1/2 inch thick with foil scrim outer cover. Insulation shall be applied in two layers and secured as recommended by manufacturer to provide a 2-hour rated enclosure with zero clearance to combustibles. The insulation shall meet UL 1978 and ASTM E-814(UL-1479) for test compliance.

- H. Outdoor air intake ducting to boilers shall be insulated with 2" thick fiberglass pipe insulation and vapor sealed in strict accordance with the manufacturer's recommendations.
- I. Heaters and Tanks: Domestic water heaters, hot water storage tanks, and converters shall be insulated with 1-1/2" thick Hydrous calcium silicate blocks with edges tightly butted and secured with 1/2 x .015" thick galvanized steel bands not over 12" on center. Finish with Schuller No. 375 insulating cement troweled on in two 1/2" thick coats over chicken wire. Last coat shall be mixed 2-to-1 by weight with Portland cement and shall be troweled smooth.
- J. Chilled water pumps shall be insulated with removable and replaceable cover of 20 gage galvanized sheet metal jacket lined with fiberglass insulation having an 'R' value of 4.0 per inch of thickness at a mean temperature of 75 Deg. F. All voids between metal cover and pump housing shall be filled with insulation. Metal cover shall be vapor sealed with Foster 95-44 or Childers CP-76 sealant after the covers are in place.
- K. Fan: Supply fans for site-built units shall be insulated with 1" thick Schuller Spin-Glas #814 with foil-scrim-kraft paper facing. Insulation shall be impaled over metal stick clips spaced 12" on center each way. Where insulation joints occur, facing tabs shall be lapped not less than 2"; all joints, laps, voids, punctures in facing shall be effectively vapor sealed with Foster 30-33 Vapor Out or Childers CP-33 vapor-barrier mastic.
- L. Roof Drain: The bottom of each roof drain, including deck clamps, shall be insulated with 1" thick fiber glass flexible insulation with an 'R' value of 4.16 with 1 mil foil-scrim-kraft paper jacket. Insulation shall be held securely in place with tape. Joints shall be lapped. Joints, voids, and punctures in the jacket shall be effectively vapor sealed with Foster Vapor Out 30-33 or Childers CP-33 Chil Out.
- M. Metal Jackets: Provide metal jackets on piping insulation in outdoor locations or where otherwise indicated. Metal jackets need not be installed for elastomeric insulation unless noted otherwise. Metal jackets shall have side and end laps at least 2 inches wide with the cut edge of the side lap turned under one inch to provide a smooth edge. Place laps to shed water. Seal laps on cold piping with Foster 95-44 or Childers CP-76 metal jacketing sealant. Secure jackets in place with aluminum or stainless steel band and screws. Space fasteners as recommended by the jacket manufacturer. Where pipes penetrate exterior walls or roof, continue the increased thickness required for piping exposed to weather and the metal jackets through the sleeve to a point 2 inches beyond the interior surface of the wall or roof.
- L. Exterior Duct:
 - 1. Exterior ductwork shall be insulated with 2" thick fiberglass rigid type duct insulation with a factory-applied facing of foil-scrim-kraft paper jacket effectively vapor sealed. Seal all surfaces watertight with Foster Vapor-Safe

heavy-duty mastic 30-90, Childers Chill Low CP-38 or approved equal as follows:

- a. Apply tack coat of vapor barrier mastic to clean surfaces at two (2) gallons per 100 square feet.
- b. Embed wet tack with Foster MAST-A-FAB, Childers Chil Glas #10 or equal white membrane. Smooth membrane to avoid wrinkles and overlap all seams minimum 2 inches.
- c. Apply finish coat of vapor barrier mastic within 1/2 hour of tack coat at four gallons per 100 square feet.
- d. Total dry film thickness shall be minimum 57 mils (1.4 mm).
- e. Paint with two coats of exterior grade latex of color as selected by Architect.

END OF SECTION

SECTION 23 20 00
HVAC PIPING AND PUMPS

PART 1 - GENERAL

1.01 CONDITIONS:

- A. The applicable provisions of Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) are hereby made a part of this section, and the Contractor is cautioned to read Section 23 00 00 carefully as items of work applicable to this section are included in Section 23 00 00.

1.02 DESCRIPTION OF WORK:

- A. Piping to connect HVAC equipment, including the following:
 - 1. Condenser Water Piping
- B. Installation of control valves and instrument wells referred to in other Division 23 sections.

1.03 RELATED WORK:

- A. Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC).
- B. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- C. Section 23 07 00, HVAC INSULATION.
- D. Section 23 65 00, COOLING TOWERS.

1.04 SUBMITTALS:

- A. In accordance with Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC), furnish the following:
 - 1. Manufacturer's Literature and Data with pump curve (where applicable):
 - a. Pipe and equipment supports. Submit calculations for variable spring and constant support hangers
 - b. Pipe and tubing, with specification, class or type, and schedule
 - c. Pipe fittings, including miscellaneous adapters and special fittings
 - d. Flanges, gaskets and bolting

- e. Valves of all types
- f. Underground piping system

PART 2 - PRODUCTS

2.01 PIPE AND EQUIPMENT SUPPORTS, PIPE SLEEVES, AND WALL AND CEILING PLATES:

- A. Provide in accordance with specifications in Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC).

2.02 PIPE AND TUBING:

- A. Condenser Water Piping (5" and smaller):

- 1. Galvanized steel: ASTM A53 Schedule 40 standard weight.

- B. Condenser Water Piping (6" and larger):

- 1. Black steel: ASTM A53 Schedule 40 standard weight.

2.03 FITTINGS FOR STEEL PIPE:

- A. 2-1/2 Inch and Larger: Welded, flanged, or grooved joints suitable for 125 psi service.

- 1. Butt Weld Fittings: ANSI B16.9 with same wall thickness as connecting piping. Elbows shall be long radius type unless otherwise noted.
 - 2. Welding Flanges and Bolting: ANSI B16.5.
 - a. Water Service: Weld neck or slip-on plain face, with 1/8-inch thick full face neoprene gasket suitable for 220 Deg. F.
 - b. Flange Bolting: Carbon steel machine bolts or studs and nuts, ASTM A 307, Grade B.
 - c. Grooved: ASTM A-536 ductile iron couplings, ASTM A-153 galvanized, Victaulic Style 77.
 - (1) Heating water gasket suitable for 230 Deg. F continuous service.
 - (2) Chilled water gaskets shall be suitable for the intended service.
 - (3) Steam service not applicable.

- B. 2-Inch and Smaller: Threaded or welded, suitable for 125 psi service.

1. Butt Welding: ANSI B16.9 with same wall thickness as connecting piping.
 2. Forged Steel, Socket welding or Threaded: ANSI B16.11.
 3. Threaded: 150 pound malleable iron, ASTM B16.3. Bushing reduction of a single pipe size, or use of close nipples, is not acceptable.
 4. Unions: Fed. Spec. WW-U-531.
 5. Water Hose Connection Adapter: Brass, pipe thread to 3/4-inch garden hose thread, with hose cap nut.
- C. Welded Branch and Tap Connections: Forged steel weldolets and thredolets may be used for branch connections up to one pipe size smaller than the main. Forged steel half-couplings, ANSI B16.11 may be used for drain, vent and gage connections.

2.04 FITTINGS:

A. Copper Tubing:

1. Solder Joint: Wrought copper, ANSI B16.22.
 - a. Solder for Drain Piping: 95-5 tin-antimony, ASTM B 32 (95TA).
 - b. Solder for Refrigerant Piping: Silver brazing alloy.

B. Bronze Flanges and Flanged Fittings: ANSI B16.24.

2.05 DIELECTRIC FITTINGS:

A. Provide where copper and ferrous metal are joined.

1. 2 Inch and Less: Threaded dielectric union.
2. 2-1/2 Inch and Larger: Flange union with dielectric gasket and bolt sleeves.

2.06 THREADED JOINTS:

A. Pipe Thread: ANSI B2.1.

B. Lubricant or Sealant: Oil and graphite or other compound approved for the intended service.

2.07 VALVES:

- A. Valves shall be Stockham, Milwaukee, Nibco, or Victaulic. All valves shall be suitable for 125 psi working pressure unless noted otherwise. Valves shall have threaded or grooved connections, except where flanges are specified they shall have flanged connections or where installed in hard drawn copper lines they may have sweat connections.
- B. Service Valves:
 - 1. 2-1/2 Inch and Smaller:
 - a. Gate valve: ASTM B-62 bronze body and solid wedge disc, rising stem MSS SP-80, Class 125.
 - b. Ball valve: ASTM B-584 Alloy 844 bronze body and stainless steel ball with teflon seats, conventional port, and blowout proof stems MSS SP-110, 150 PSI/600 PSI non-shock. Provide extended stem per application.
 - 2. 3 Inch and Larger:
 - a. Water service: ASTM A-536 ductile iron body butterfly, ASTM B-148 alloy 954/955 disc, EPDM seats, Class 200, locking-type manual lever.
 - b. Steam service (low pressure): Iron body gate, solid bronze wedge disc, flanged, outside screw and yoke, MSS SP-70, bronze mounted, Class 1 (125 psig).
- C. Globe Valves:
 - 1. 2-Inch and Smaller: ASTM B-62 bronze body and disc, MSS SP-80, Class 125.
 - 2. 2-1/2 Inch and Larger: Similar to above, but ASTM A-126 flanged cast iron body, with bronze trim, bolt bonnet, OS & Y, renewable seat and disc.
- D. Check valves in sizes up to and including 2 inch shall be all bronze, swing type, with regrinding disc capable of being reground without removing the valve body from the line. Sizes 2-1/2 inch and larger shall be iron body, bronze-trimmed, regrinding seat, swing type, for water service.

2.08 GAGES, PRESSURE AND COMPOUND:

- A. Pressure gauges shall be Ashcroft bourdon tube, general service type suitable for 125 psi service. Gauges shall not be less than 4" dial type with aluminum case and gauge cock. Gauges shall be graduated in feet of water and psi.
- B. Range of Gages: Provide range equal to at least 150 percent of normal operating range.

2.09 THERMOMETERS:

- A. Weksler Instruments Type AA, Fed. Spec. GG-T-321, non-mercury fluid filled type, blue column, clear plastic window, with 6-inch brass stem, straight, adjustable angle as required for each in reading.
- B. Scale: Not less than nine inches, range as described below, two degree graduations.
- C. Separable Socket (Well): Brass, extension neck type to clear pipe insulation.
- D. Scale ranges may be slightly greater than shown to meet manufacturer's standard.

2.10 UNDERGROUND PIPING:

- A. Heated or Chilled water lines underground: Pipe and insulation shall be Rovanco or Ricwel insulated piping system complete with pipe, insulation, outer jacket, and matching fittings for a complete installation. Pipe shall be Schedule 40 electric resistance weld steel pipe. Pipe shall be factory insulated with polyurethane closed cell foam completely filling the annular space between the service pipe and the outer jacket. The insulation shall be 1.68 inches thick having a thermal resistance (R) of 7.5 per inch thickness. The outer jacket shall be watertight, high impact seamless polyvinylchloride (PVC) suitable for Department of Highway H2O Classification. Provide pipe anchors as indicated and as required to control pipe expansion. Provide compressible material at expansion legs. Insulated piping system shall be installed in strict accordance to the manufacturer's recommendations.
- B. Manufacturer's Field Installation Instruction: On completion of the installation, the Contractor shall deliver to the Owner a certificate from the manufacturer stating that the installation has been made in accordance with the manufacturer's recommendations.

PART 3: EXECUTION

3.01 PIPING INSTALLATION:

A. General:

1. The drawings show the general arrangement of pipe and equipment but do not show all fittings and offsets that may be necessary.
2. Store materials to avoid excessive exposure to weather or foreign materials. Keep inside of piping relatively clean during installation and protect open ends when work is not in progress.
3. Support piping securely. Refer to Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC). Suspended horizontal piping shall be supported by adjustable wrought steel clevis hangers, except that straight runs of piping with 40 feet or more between anchor and expansion device shall be supported on roller type hangers or supports. Protection saddle, welded to pipe, shall be provided at each roller support. All supports shall be attached to the building structure and shall in no way be attached to the supports or other equipment, piping, or ductwork. Where supports bear on copper pipe, they shall be copper plated. Chain, strap, or other makeshift devices will not be permitted as hangers or supports. Maximum pipe support spacing shall be 10'-0" on center, except where grooved couplings are used, no pipe length shall be left unsupported between any two grooved couplings. Supports on chilled water and condensate drain lines shall be provided with a 12" long section of hydrous calcium silicate, which shall have joints sealed and covered with a vapor barrier jacket. Hanger rods shall be 3/8" diameter size for pipes up through 2", 1/2" diameter size for 1-1/2" through 3", 5/8" diameter for pipes 4" through 5", and 7/8" diameter size for 6" through 12". Pipe hanger rods shall be attached to the top chord only on steel joists and beams by joist or beam clamps without welding. Welding of support rods and connection at any place other than the top chord will not be permitted unless written approval is granted by the Architect.
4. Install piping generally parallel to walls and column centerlines, unless shown otherwise on the drawings. Space piping, including insulation, to provide one inch minimum clearance between adjacent piping or other surface. Pipe shall be installed to permit free expansion and contraction without damage to joints or hangers. Slope piping down in the direction of flow not less than one inch in 40 feet. Provide eccentric reducers to keep bottom of sloped piping flat. All high points in water lines shall be provided with manual-air vents, all low points with drains. Condensate drain lines shall slope 1/8" per foot in direction of flow.
5. Anchors for pipe shall be provided as indicated or as required at the job site to localize expansion and contraction of pipe. Anchors shall consist of heavy steel

or brass collars bolted or welded to the pipe and rigidly connected to the building structure unless indicated otherwise. Anchor braces shall not be attached in places where they will damage or injure the structure during installation or by the weight or expansion force of the pipe line after installation.

6. Locate and orient valves to permit proper operation and access for maintenance of packing, seat and disc. Generally locate valve stems in overhead piping in horizontal position. Control valves usually require reducers to connect to pipe sizes shown on the drawings. Isolation service valves shall be installed on each side of major piece of equipment such as a pump, boiler, chiller, heating coil, cooling coil and other similar items, and at any other points indicated or required for draining, isolation or sectionalizing purposes. Control valves shall be installed in accordance with control manufacturer's recommendations.
7. Offset equipment connections to allow valving off for maintenance and repair with minimal removal of piping. Provide flexibility in equipment connections and branch line takeoffs with 3-elbow swing joints where noted on the drawings.
8. Tee water piping runouts or branches into the side of mains or other branches. Avoid bull-head tee, which is two return lines entering opposite ends of a tee and exiting out the common side or two supply lines exiting opposite ends of a tee and entering the common side.
9. Connect piping to equipment as shown on the drawings. Piping connections to equipment shall be provided with unions or flanges. (Banked water coils shall be piped in reverse return arrangement.) (Steam coils shall be trapped individually.) (Vacuum breaker shall be provided at steam supply connection to each steam coil or steam bundle.) A straight spool piece equal in length to impeller diameter shall be provided at suction connection to each pump. Install components furnished by others such as:
 - a. Flow elements (orifice unions), control valve bodies, flow switches, pressure taps with valve, and wells for sensors.
 - b. Thermometer Wells: In pipes 2-1/2 inches and smaller, increase the pipe size to provide free area equal to the upstream pipe area.

B. Pipe Joints:

1. Sweated: Copper tubing shall be cut square, ends reamed, and all filings and dust wiped from interior of pipe. Joints shall be soldered with solder drawn through the full fitting length. Excess solder shall be wiped from joint before solder hardens. Solder shall be 95/5 composition; 50/50 will not be allowed.

2. Threaded: Threaded joints shall be made with tapered threads properly cut. Joints shall be made tight with a stiff mixture of litharge and glycerin or other approved thread joint compound applied with a brush to the male threads only. Not more than three threads shall show after the joint is made up.
 3. Grooved: Pipe coupling joints shall be assembled according to manufacturer's specifications. Pipe shall be square cut and grooved in accordance to manufacturer's specifications. Gaskets shall be verified as suitable for the intended service and shall be coated on the lips and back with a thin uniform coat of lubricant. The coupling housing shall be assembled over the gasket and shall engage both grooves. The nuts shall be uniformly tightened until the housing pads are firmly together metal to metal.
 4. Welded: Joints shall be fusion-welded by qualified welders in accordance with ANSI B31.10, unless otherwise required. Changes in direction of piping shall be made with fittings only. Mitering or notching pipe to form elbows and tees or other similar type construction will not be permitted. Saddle-type welding outlets may be used for equipment take-offs from the mains.
 5. Flanges and Unions: Fittings shall be faced true and made square and tight. Unions shall be 125 psi service, bronze seat type. Flanges shall be ANSI Standard 125 psi service with 1/16" thick red rubber gaskets. Unions and flange joints shall be provided on each side of each valve 2-1/2" or larger and in each line immediately preceding the connection to each major piece of equipment such as a (pump), (converter), (boiler), (chiller), (heating coil), (cooling coil) and other similar items.
 6. Dielectric fittings such as couplings, unions, or flanges, shall be installed to isolate pipes of non-ferrous metal where connection is made to ferrous metal. Isolation shall be accomplished by non-metallic, unthreaded sleeves or gaskets or a combination of both. Fittings shall be so designed that the installing tools cannot come in contact with the insulating material. Materials shall withstand pressure and temperature as required.
- C. Leak Testing: Inspect all joints and connections for leaks and workmanship and make corrections as necessary.
1. A hydrostatic test at 1.5 times design pressure for 4 hours. Factory tested equipment (converters, exchangers, coils, etc.) need not be field tested. Avoid excessive pressure on mechanical seals and safety devices.

3.02 FLUSHING AND CLEANING PIPING SYSTEMS:

A. Water Piping: Clean systems as recommended by the suppliers of the boiler water treatment chemicals specified in this section.

1. Initial Flushing: Remove loose dirt, mill scale, metal chips, weld beads, rust, and like deleterious substances without damage to any system component. Bypass factory cleaned equipment unless acceptable means of protection are provided and subsequent inspection of hide-out areas takes place. Isolate or protect clean system components, including pumps and pressure vessels, and remove any component which may be damaged. Open all valves, drains, vents and strainers at all system levels. Remove plugs, caps, spool pieces, and components to facilitate early debris discharge from system. Sectionalize system to obtain debris carrying velocity of 6 feet per second, if possible. Connect deadend supply and return heads as necessary. Flush bottoms of risers. Install temporary strainers where necessary to protect down-stream equipment. Supply and remove flushing water and drainage by various type hose, temporary or permanent piping and Contractor's booster pumps. Flush until clean.
2. Cleaning: Using products recommended by the suppliers of the boiler water treatment chemicals specified in this section, circulate systems at normal temperature to remove adherent organic soil, hydrocarbons, flux, pipe mill varnish, pipe joint compounds, iron oxide, and like deleterious substances not removed by initial flushing, without chemical or mechanical damage to any system component. Removal of tightly adherent mill scale is not required. Keep isolated equipment which is "clean" and where deadend debris accumulation cannot occur. Sectionalize system as possible, to circulate at velocities not less than 6 feet per second. Circulate each section for not less than 4 hours. Blowdown all strainers, or remove and clean as frequently as necessary. Drain and prepare for final flushing.
3. Final Flushing: Return system to conditions required by initial flushing after all cleaning solution has been displaced by clean make-up. Flush all deadends and isolated clean equipment. Gently operate all valves to dislodge any debris in valve body by throttling velocity. Flush not less than one hour.

3.03 WATER TREATMENT:

A. The Contractor shall provide services of a water treatment firm to test the raw water at the site and provide chemicals necessary to maintain the following characteristics of water in the syste for a period of one year:

Hardness: 0.00

Iron: 0.00

Total Dissolved Solids: 1500-1750 ppm (as Ca C03)

Silica: 60 ppm or less
pH: 10.4 or above

- B. Close and fill system as soon as possible after final flushing to minimize corrosion.
- C. Charge system with chemicals.

3.05 OPERATING AND PERFORMANCE TEST AND INSTRUCTION:

- A. Perform all tests and make reports in accordance with Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) and Section 23 05 93, TESTING, ADJUSTING, AND BALANCING FOR HVAC.

END OF SECTION

SECTION 23 65 00

COOLING TOWERS

PART 1 - GENERAL

1.01 CONDITIONS:

- A. The applicable provisions of Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC) are hereby made a part of this section and the Contractor is cautioned to read Section 23 00 00 carefully as items of work applicable to this section are included in Section 23 00 00.

1.02 DESCRIPTION OF WORK:

- A. Cooling Tower.
- B. Water Treatment System for Cooling Tower.
- C. Tower Winterizing Accessories.

1.03 RELATED WORK:

- A. Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC).
- B. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING FOR HVAC
- C. Section 23 09 00, INSTRUMENTATION AND CONTROLS FOR HVAC.
- D. Section 23 20 00, HVAC PIPING AND PUMPS.
- E. Section 23 21 33, VARIABLE SPEED DRIVES.
- F. Section 23 64 00, PACKAGED WATER CHILLERS.

1.04 QUALITY ASSURANCE:

- A. Machinery Guards: Provide guards for belts, chains, couplings, pulleys, sheaves, shafts, gears, fans, and other moving parts regardless of height above floor.
- B. Provide external service platform, vertical ladder and ladder extension for access and safety on top of cooling tower.

1.05 SUBMITTALS:

- A. In accordance with Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC), furnish the following.
 - 1. Manufacturer's Literature and Data:
 - a. Cooling Tower.
 - b. Water Treatment System for Cooling Tower.
 - b. Tower Winterizing Accessories.
 - 2. Performance Rating:
 - a. Certified capacity as specified.
 - b. Energy consumption to meet specified equipment.
 - c. Noise criteria to meet specified equipment.
 - 3. Operation and Maintenance Manuals: Submit in accordance to Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC).

PART 2 - PRODUCTS

2.01 COOLING TOWER (COUNTERFLOW):

- A. General - Cooling tower shall be EVAPCO, Baltimore Aircoil or Marley, induced-draft, counterflow, factory-assembled cooling tower.
- B. Basin: The entire basin area shall be constructed of Type 304 stainless steel for long life and durability. The basin area shall include all steel components from the base of the unit to the top of the air inlet louver screens. Standard basin accessories shall include overflow, drain, anti-vortexing hood, Type 304 stainless steel strainers. The entire basin area shall incorporate a stepped configuration for reduced water volume, lower operating weight and easier basin maintenance. The upper and lower pan bottoms shall be sloped to provide positive drainage of the complete basin section. Depressed side outlet sumps which are not an integral part of the basin will not be acceptable.
- C. Casing: The casing shall be constructed of G-235 hot-dip galvanized steel. The casing panels shall totally encase the sides of the fill section to protect the surface from direct atmospheric contact. The casing shall not be constructed of flammable materials such as fiberglass.

- D. Fan Motors: Two (2) 7.5 HP totally enclosed air over (T.E.A.O.) ball bearing inverter duty fan motors with a 1.15 service factor shall be furnished suitable for cooling tower service on 460 volts, 60 hertz, and 3 phase. Motors shall be mounted on an adjustable base that allows the motor to swing to the outside of the unit for servicing. A hinged protective cover shall shield the motor from the weather. Variable speed drive (VFD) shall be provided for each fan motor.
- E. Drives: The fan drives shall be a multi-groove, solid back V-belt with taper lock sheaves, designed for 1.5 service factor of the motor nameplate horsepower. The belt material shall be neoprene reinforced with polyester cord and specifically designed for cooling tower service. Fan and motor sheaves shall be aluminum alloy construction. Belt adjustment shall be accomplished from the exterior of the unit. Bearing lube lines shall be extended to the exterior of the unit for easy maintenance. All sheaves located in the airstream shall be constructed of aluminum alloy. Vented guards will not be acceptable. If internal belt adjustment is necessary, an internal working platform and ladder is required to access the drive system.
- F. Fan Shaft Bearings: Fan shaft bearings shall be heavy duty self-aligning ball type with self locking collars and grease fittings extended to the outside of the unit. Bearings shall be designed for a minimum L-10 life of 75,000 hours.
- G. Fill: The cooling tower fill shall be PVC (Polyvinyl Chloride) of cross-fluted design for optimum heat transfer efficiency. The cross-fluted sheets shall be bonded together for strength and durability. The fill shall be fabricated, formed and installed by the cooling tower manufacturer and shall be elevated a minimum of 4 feet above the floor of the cold water basin to facilitate cleaning. The fill shall be suitable for use as a working platform. The PVC fill shall be self-extinguishing for fire resistance with a flame spread rating of 5 per ASTM E84-81a. It shall also be resistant to rot, decay, and biological attack. The fill shall be able to withstand a water temperature of 130 Deg. F.
- H. Non-Corrosive Water Distribution System: Each cell of the cooling tower shall have one (1) hot water return inlet connected to a main spray header. The spray header and branches shall be constructed of Schedule 40 polyvinyl chloride (PVC) pipe for corrosion resistance and shall have a steel connection which is beveled for weld/grooved for a mechanical coupling to attach the external piping. The spray header and branches shall be removable for cleaning purposes and have threaded end caps to allow debris to be removed. The water shall be distributed over the fill by precision molded ABS spray nozzles with large 3/8 by 1 inch orifice openings and integral sludge ring to eliminate clogging. The nozzles shall be threaded into the water distribution piping to assure positive positioning. If open type gravity distribution pans are used, they shall be constructed of non-corrosive materials (FRP or PVC).

- I. Eliminators: The eliminators shall be constructed entirely of inert polyvinyl chloride (PVC) in easily handled sections and be completely separate from the fill section for maximum efficiency. The eliminator design shall incorporate three changes in air direction to assure complete removal of all entrained moisture from the discharge air stream. Maximum drift rate shall be less than 0.001% of the circulating water rate.
- J. Air inlet louver screens: The air inlet louver screens shall be constructed from polyvinyl chloride (PVC) and mounted in easily removable Type 304 stainless steel frames on all four sides of the cooling tower for access to the entire basin area for maintenance. The louvers shall have a minimum of two changes in air direction to prevent splashout, block direct sunlight from entering the basin, and have a maximum 3/4" opening to prevent debris from entering the basin.
- K. Finish: The basin material shall be constructed of Type 304 stainless steel for maximum protection against corrosion. The casing material shall be constructed of G-235 heavy gauge mil hot-dip galvanized steel for protection against corrosion. G-235 hot-dip galvanized steel designates an average coating thickness of 2.35 ounces of zinc per square foot on the steel. During fabrication, all panel edges shall be coated with a 95% pure zinc-rich compound.
- L. Working Platform and Ladder with Davit: External service platform with vertical ladder shall allow easy servicing of the fan motor and water distribution system. Ladder extensions shall be provided as needed. To provide a convenient platform to perform work, the heavy duty galvanized steel platform with stainless steel mounting hardware shall be self-supporting to eliminate the need for any external support. The working platform shall use a vertical ladder and ship in sections for easy installation. The davit shall facilitate the removal of motors and gear drives. The davit shall be constructed of heavy-duty galvanized steel and shall be mounted on the side of the unit in a stainless steel bracket. The fan motor and gear davit shall ship loose and shall be installed in the field. The working platform and ladder shall meet all applicable OSHA requirements.
- M. Electric Heaters: Electric immersion heaters shall be located in the basin of the tower. They shall be sized to maintain a +40 Deg. F. pan water temperature at -20 Deg. F. ambient with the fans off. They shall be furnished with a combination thermostat/low water protection device to cycle the heaters on when required and to prevent the heater elements from energizing unless they are completely submerged. All components shall be enclosed in rugged, weather proof enclosures for outdoor use. Heater control packages shall include contactors, transformers and disconnect switches.
- N. Electric Water Level Control: An electric water level control system shall be provided in place of the standard mechanical makeup valve and float assembly. This package shall provide very accurate control for the pan water level and not require field adjustment, even under widely varying operating conditions. The control shall consist of multiple heavy-duty stainless steel probes. These probes shall be mounted

external to the unit in a vertical standpipe. For winter operation, the standpipe shall be wrapped with electric heating cable and insulated to protect it from freezing. The weather protected slow closing solenoid valve shall be factory installed on the make-up water connection, ready for piping to a water supply with a pressure between 25 and 50 psig.

- O. Fan vibration cutout switches shall be provided to cut off the fan motors if the fan support structure starts to vibrate extensively. Alarm signal shall communicate with the BAS Control System.
- P. Structural supports and mounting shall be provided as necessary to support and secure the tower in accordance with the recommendations of the manufacturer of the tower for this project.
- Q. 5-Year Warranty: The unit shall be warranted against failure caused by defects in materials and workmanship for five (5) years from the date of shipment. All cooling tower and drive system components shall be included.

2.02 COOLING TOWER (CROSSFLOW):

- A. General - Cooling tower shall be Marley or equal, induced-draft, cross-flow, factory-assembled cooling tower. Tower fan orientation shall discharge horizontally. Vertical discharge towers are not acceptable.
- B. Basin: The entire basin area shall be constructed of Type 304 stainless steel for long life and durability. The basin area shall include all steel components from the base of the unit to the top of the air inlet louver screens. An open basin above the fill section shall receive hot water piped to each cell of the tower. This basin shall be an integral portion of the top section of the tower, precluding the need for installation and sealing. Water shall enter the basin through a removable wave-suppressor splash box. The basin shall be deep enough to provide adequate freeboard against overflow and splash-out. Removable and replaceable polypropylene nozzles installed in the floor of the basin shall provide full coverage of the fill by gravity flow. Nozzles must all have the same orifice size and be spaced symmetrically in both longitudinal and transverse direction. Removable fiberglass covers for the distribution basin are required. The cold water basin shall be a single piece, joined to the tower structure at the factory. For maximum installation flexibility, basin accessories shall include both a side suction connection and, for gravity flow, provisions for a hole and bolt circle in the basin floor. Both connections shall include a debris screen and anti-cavitation device. A factory-installed, float-operated, mechanical makeup valve shall be included, having a 3/4" diameter inlet connection. The overflow shall consist of a 1 1/4" diameter PVC standpipe. When unscrewed from its fitting, this shall serve as a flushout drain.
- C. Casing: Structural components of the tower, including the cold water basin, framework, casing, hot water basin and fan cylinder shall be fabricated of fiber

- reinforced polyester. Steel components, including the mechanical equipment support members, shall be heavy gauge steel, protected against corrosion by G-235 galvanizing per ASTM-A-653. All components subjected to factory welding shall be hot-dip galvanized after fabrication per ASTM A-123. Cold galvanizing is not acceptable.
- D. Fan Motor: Totally enclosed air over (T.E.A.O.) ball bearing inverter duty fan motor with a 1.15 service factor shall be furnished suitable for cooling tower service on 208 volts, 60 hertz, and 3 phase. Motors shall be mounted on an adjustable base that allows the motor to swing to the outside of the unit for servicing. A hinged protective cover shall shield the motor from the weather. Variable speed drive (VFD) shall be provided for the fan motor.
 - E. Fan and Drives: Fan(s) shall be adjustable-pitch propeller type. Fan shall be driven through V-belt(s) with a minimum service factor of 1.5 based on full motor HP and protected with a belt guard. The fan and fan pulley shall be supported by a stainless steel fan shaft in a cast iron oil-lubricated tapered roller bearing assembly with externally accessible remote oil reservoir for easy maintenance.
 - F. Fan Shaft Bearings: Fan shaft bearings shall be heavy duty self-aligning ball type with self-locking collars and grease fittings extended to the outside of the unit. Bearings shall be designed for a minimum L-10 life of 75,000 hours.
 - G. Fill: Fill shall be film-type, thermoformed PVC, with louvers and drift eliminator formed as part of each fill sheet. Fill shall be suspended from hot dip galvanized structural tubing supported from the upper tower structure, and shall be elevated above the floor of the cold water basin to facilitate cleaning. Air inlet faces of the tower shall be free of water splash-out. Guaranteed drift losses shall not exceed 0.005% of the design GPM.
 - H. Electric Heaters: Electric immersion heaters shall be located in the basin of the tower. They shall be sized to maintain a +40 Deg. F. pan water temperature at -20 Deg. F. ambient with the fans off. They shall be furnished with a combination thermostat/low water protection device to cycle the heaters on when required and to prevent the heater elements from energizing unless they are completely submerged. All components shall be enclosed in rugged, weather proof enclosures for outdoor use. Heater control packages shall include contactors, transformers and disconnect switches.
 - I. Electric Water Level Control: An electric water level control system shall be provided in place of the standard mechanical makeup valve and float assembly. This package shall provide very accurate control for the pan water level and not require field adjustment, even under widely varying operating conditions. The control shall consist of multiple heavy-duty stainless steel probes. These probes shall be mounted external to the unit in a vertical standpipe. For winter operation, the standpipe shall be wrapped with electric heating cable and insulated to protect it from freezing. The

weather protected slow closing solenoid valve shall be factory installed on the make-up water connection, ready for piping to a water supply with a pressure between 25 and 50 psig.

- J. Fan vibration cutout switches shall be provided to cut off the fan motors if the fan support structure starts to vibrate extensively. Alarm signal shall communicate with the BAS Control System.
- K. Structural supports and mounting shall be provided as necessary to support and secure the tower in accordance with the recommendations of the manufacturer of the tower for this project.
- L. 5-Year Warranty: The unit shall be warranted against failure caused by defects in materials and workmanship for five (5) years from the date of shipment. All cooling tower and drive system components shall be included.

2.03 WATER TREATMENT SYSTEM FOR THE COOLING TOWER:

- A. General - When the condenser water system is initially placed in operation and for one calendar year after Owner's acceptance of installation, the Contractor shall furnish a complete water treatment service for control of corrosion, carbonate scale, and bacterial growth.
- B. Performance of work - This system shall be provided by a local established company maintaining 24-hour service in the area and shall include all necessary service visits to the system to deliver and apply all chemicals required to continuously maintain, under normal operating conditions, approved chemical concentrations in the system. Building employees shall not be required to handle, store, or apply any chemicals. The Contractor shall furnish and apply all chemicals, adjust the chemical feed devices as required to maintain the approved treatment standards, and maintain complete records concerning the treatment applications, control adjustments, and the periodic laboratory analyses of the treated water in the system.
- C. Chemical feed devices - The Contractor shall furnish all pumps, labor, standard pipe, valves, fittings, and insulation required to completely install the chemical feed devices in accordance with approved shop drawings. The chemical feed devices shall be furnished by the Contractor, and title to these devices shall be assumed by the Owner upon termination of the original services contract with Contractor.
- D. Bleed - Contractor shall set and lock the bleed valve to the bleed-off rate recommended by the cooling tower manufacturer.
- E. Piping of bleed - The bleed shall be piped to the nearest drain.
- F. Condenser check - The condenser shall be checked for scaling after the first full cooling season and shall be chemical feed adjusted accordingly.

- G. Clean-out - The tower and tower basin shall be cleaned out, and no water fill shall be allowed until tower is completely clean.

2.04 SIDESTEAM FILTER:

- A. Side steam filter shall be a complete system as manufactured by Tower-Flo Filter Division, or equal, to provide filtration of cooling tower water for the existing cooling tower. System shall have capacities as indicated on the drawings and shall be installed in accordance with the manufacturer's recommendations. Filter assembly shall be provide complete with high rate sand filter vessel, valve assembly, control panel, pump and motor, strainer, media, all factory assembled on a structural steel primed and painted base. Sweeper-eductor nozzles shall also be provided for installation in the existing cooling tower.. The system shall be shipped as a complete factory assembled and tested unit. Filter media shall be shipped with the unit for field installation.
- B. Permanent media, high-rate sand filter shall be a vertical pressure vessel which is pressure molded from high density themoplastic resin. Filter shall have special influent baffle in the top of the tank, a bed of filter sand, and a mechanical underdrain system to collect the filtered water and direct filtered water to the return piping system. The filter shall be capable of operating under pressure. The system shall be equipped with a manual air release valve, an automatic pressure relief valve set at 50 psi, and 0-60 psi influent and effluent pressure gauges mounted in a common panel. Filter system shall be provided to automatically back wash using water from the same source they are filtering.
- C. Control valves shall be 3-way brass ball valves with single electric actuator and mechanical linkage.
- D. The control panel shall be UL labeled in a NEMA 4X corrosion resistant fiberglass enclosure and shall provide all controls for automatic backwash operation. Backwash shall be initiated by one of the following methods:
 - 1. Differential pressure switch (external to the enclosure)
 - 2. Manual backwash pushbutton on face of control panel or
 - 3. 100 hour "re-setting" timer (ΔP switch closure or manual initiation resets timer) for backup initiation. The controls shall automatically stop the system's pump whenever valves are to be shifted which prevents water hammer, pipe flexing, and the risk of damage to collection laterals in the vessel.
 - 4. Control panel shall be provided with alarms and shall interface with the Building Automation System to provide alarm notification of off normal operation.
- E. The pump shall be complete with cast brass impeller, motor, motor bracket, mechanical seal, and volute with stainless steel fasteners to resist corrosion. The

- pump shall be self-priming type. The motor shall be totally enclosed type with its external fan-cooled construction, with pre-lubricated ball bearings on both ends, NEMA 56C frame, high tensile steel shaft, enclosed in a heavy gauge rolled steel case and rated at a service factor of 1.15 at 40°C over ambient. Motors shall be UL approved and CSA stamped.
- F. Pump suction strainer assembly shall be cast brass body, brass lid, and a cyclac strainer basket. The lid shall be held in place by two brass lockhandles and include an o-ring positive seal.
 - G. Filter media shall be provided by the filter manufacturer and shall be shipped with the unit for field installation. The filter media shall be quartzite or silica with a relative size of .45 to .55 mm. Clean filter media shall remove particles 20 microns in size and larger. Accumulated material on the top of the media bed, called a filter cake, contributes to finer particle removal as the filter becomes “dirtier”. Removal of over 99% of 10 micron particles and 90% of 5 micron particles can be expected over the course of a filter cycle.
 - H. Sweeper-Eductor Nozzles shall be 1/4" MPT, ABS plastic furnished complete with clip-on nozzle holders

2.05 TOWER WINTERIZING ACCESSORIES:

- A. Pipe heaters shall be Chromalox or equal pipe heating tape complete with thermostat. Heater shall protect all exposed water pipe at ambient temperatures down to -10EF. Heater shall be protected with Chromalox or equal insulating wrap. Voltage shall not exceed 120V.
- B. Solenoid valve for bypass line shall be Alco or Asco direct-acting solenoid with waterproof head.
- C. Low water cut-off shall be Magnetrol TF63. Install in cooling tower basin at suitable height to de-energize basin heater if water level is less than 1/2" above top of heater.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Handle and install unit and accessories in accordance with manufacturer's written instructions.
- B. Provide concrete pads and vibration isolation as specified.
- C. Provide structural supports and mounting accessories in addition to that indicated on the contract documents as necessary to support and secure the cooling tower in

accordance with the recommendations of the manufacturer of the tower proposed for this project. Mount tower at sufficient height to provide prime for the condenser water pump.

- D. Coordinate the cooling tower with Section 23 09 00, INSTRUMENTATION AND CONTROLS FOR HVAC and verify proper and safe operation through all ranges of the variable speed drives to prevent excessive noise and vibration.

3.02 TESTS:

- A. Perform tests and make reports in accordance with Section 23 00 00, HEATING, VENTILATING AND AIR-CONDITIONING (HVAC), and Section 23 05 93, TESTING, ADJUSTING AND BALANCING FOR HVAC.
- B. The cooling tower shall be tested for safe, controlled operation by the manufacturer's representative.

END OF SECTION

DRAWINGS: Three drawings are also being posted as separate files on the Clarke County website, www.clarkecounty.gov, under business and current solicitations in order to provide vendors with a clear image and the ability to zoom in and out on them. The drawings are a part of this IFB and are labeled:

- Drawing #1 “T-1” for RFP #16-0525 HVAC-D.G. Elementary Lower Campus”
- Drawing #2 “E1” for RFP #16-0525 HVAC-D.G. Elementary Lower Campus”
- Drawing #3 “M-1” for RFP #16-0525 HVAC-D.G. Elementary Lower Campus”

Attachment A - Reference Form

This form should be completed and returned as part of your bid packet. Offerors should provide the following references for four (4) most recent similar projects/jobs, preferably within Virginia.

CONTRACTOR'S NAME

IFB#

16-0525

1. FIRM NAME	
CONTACT PERSON	TITLE
STREET ADDRESS, CITY, STATE, ZIP	
TELEPHONE	FAX
SPECIFIC INFORMATION	
2. FIRM NAME	
CONTACT PERSON	TITLE
STREET ADDRESS, CITY, STATE, ZIP	
TELEPHONE	FAX
SPECIFIC INFORMATION	
3. FIRM NAME	
CONTACT PERSON	TITLE
STREET ADDRESS, CITY, STATE, ZIP	
TELEPHONE	FAX
SPECIFIC INFORMATION	
4. FIRM NAME	
CONTACT PERSON	TITLE
STREET ADDRESS, CITY, STATE, ZIP	
TELEPHONE	FAX
SPECIFIC INFORMATION	

Attachment B – Bid Response Form

This form should be completed and returned, **IN TRIPLICATE**, as part of your bid packet.

1. NAME AND ADDRESS OF FIRM/BIDDER

SIGNATURE		
BY (print name)		
TITLE	DATE	
COMPANY NAME		
STREET ADDRESS		
CITY, STATE, ZIP		
TELEPHONE	FAX	E-MAIL

SOCIAL SECURITY OR FEDERAL TAX I.D. #		
CLARKE COUNTY BUSINESS LICENSE #		
VIRGINIA CONTRACTOR'S LICENSE #	EXPIRATION DATE	CLASS
NAME OF INSURANCE CARRIER, BROKER OR AGENCY		

Pursuant to and in accordance with "INVITATION FOR BIDS #16-0525 ", the undersigned agrees to provide and install the cooling tower replacement as specified in this IFB:

2. PROPOSED COSTS

LUMP SUM COST TO PROVIDE AND INSTALL COOLING TOWER REPLACEMENT AS SPECIFIED IN THIS IFB.

\$ _____

3. ESTIMATED TIME TO COMPLETE

PLEASE IDENTIFY THE ESTIMATED NUMBER OF CALENDAR DAYS FROM THE DATE OF AWARD NEEDED TO COMPLETE THE SPECIFIED WORK

_____ CALENDAR DAYS

All prices shall include all fuel, transportation, materials, labor, insurance, bonds, licenses, equipment, overhead, and other applicable costs needed to fully complete the job as specified in this IFB.

All prices shall not include sales tax; Clarke County is tax-exempt.

4. SUBCONTRACTORS

The following Subcontractors are proposed for the item(s) of work listed. Trade contractors are subject to review per the General Conditions. List only firms that will supply any labor at this site. Submit a reference form for each Subcontractor listed.

ITEM OF WORK	SUBCONTRACTOR

5. RECEIPT OF CORRESPONDENCE

The undersigned acknowledges receipt and inclusion of the following into the bid: (If none, write "NONE".)

- A. Addendum No. _____ Dated: _____
- B. Addendum No. _____ Dated: _____

6. BID PRESENTATION

- A. The Offeror having carefully examined the Bid Documents and all other related documents, and having become familiar with all conditions affecting the proposed work, including the availability of labor, materials and equipment, agrees to perform all Work required by the IFB Documents at the prices noted above.
- B. The Offeror, if awarded a Contract, agrees to commence the work on the date(s) specified in the Notice(s) to Proceed; to carry the work forward expeditiously with adequate forces; and subject to authorized adjustments, to achieve completion in accordance with the dates or periods of performance set forth in the Contract Documents.

8. OFFEROR'S ORGANIZATION (strike out all conditions that do not apply)

- A. An individual or sole proprietorship
- B. A partnership
- C. A joint venture
- D. A corporation organized under the laws of the State of _____

9. ATTACHMENTS

The following is a checklist of items that are to be included with the Bid Response Form and should be completed by the Offeror:

- A. _____ Attachment A – Reference Form
- B. _____ Sample Certificate of Insurance
- C. _____ Signed copy of Addendum (if any)
- D. _____ Bid Bond
- E. _____ Copies of any required trade licenses, State Contractor's License
- F. _____ Attachment C – Company Certification Form
- G. _____ Attachment D – SCC Compliance Form

10. SIGNATURE AND SEAL

Signed and sealed this _____ day of _____, 20____

OFFEROR - SIGNATURE: _____

NAME: _____

TITLE: _____

Notary Public

My commission expires the _____ day of _____, 20____

END OF BID RESPONSE FORM



ATTACHMENT C:
CLARKE COUNTY
DEPARTMENT OF JOINT ADMINISTRATIVE SERVICES
PURCHASING DEPARTMENT
129 Ramsburg Lane Berryville, VA 22611
Phone (540) 955-5185 Fax (540) 955-0456

Compliance with Virginia Law for Transacting Business in Virginia.

The undersigned hereby agrees, if this Bid/Proposal is accepted by Clarke County, for such services and/or items that the undersigned has met the requirements of the Virginia Code Section 2.2-4311.2

Please complete the following by checking the appropriate line that applies and providing the requested information:

A. _____ Bidder/offeror is a Virginia business entity organized and authorized to transact business in Virginia by the SCC and such bidder's/offeror's Identification Number issued to it by the SCC is _____.

B. _____ Bidder/offer is an out-of-state (foreign) business entity that is authorized to transact business in Virginia by the SCC and such bidder's/offeror's Identification Number issued to it by the SCC is _____.

C. _____ Bidder/offeror does not have an Identification Number issued to it by the SCC and such bidder/offeror is not required to be authorized to transact business in Virginia by the SCC for the following reason(s):

Please attach additional sheets of paper if you need to explain why such bidder/offeror is not required to be authorized to transact business in Virginia.

Legal Name of Company (as listed on W-9)

Legal Name of Bidder/Offeror

Date

Authorized Signature

Print or Type Name and Title

Dr. Chuck Bishop
Superintendent

Rick Catlett
Assistant Superintendent



Dr. Cathy G. Seal
Director of Curriculum and Instruction

Randy Trenary
Director of Operations

Clarke County Public Schools

309 West Main Street
Berryville, Virginia 22611

Phone: (540) 955-6100 **www.clarke.k12.va.us** **FAX:** (540) 955-6109

CLARKE COUNTY, VIRGINIA
IFB#16-0525
HVAC-D.G. COOLEY ELEMENTARY-LOWER CAMPUS

III. ATTACHMENT D - COMPANY CERTIFICATION

The undersigned, on behalf of _____
(insert company name)

hereby certifies to the Clarke County School Board and Clarke County Public Schools that any employee of the company who will have direct contact with students on school property during regular school hours or during school-sponsored activities while providing services called for in the contract:

- A. have not been convicted of a felony or any offense involving the sexual molestation or physical or sexual abuse or rape of a child.

This certification is provided in accordance with the provisions of § 22.1 - 296.1 of the Code of Virginia.

Certification is also made in accordance with § 2.2 - 4311.1 that:

- A. the contractor does not, and shall not during the performance of the contract for goods and services, knowingly employ an unauthorized alien as defined in the Federal Immigration Reform and Control Act of 1986.

Signature: _____ Date: _____

Printed Name and Title of Person Making Certification

Address: _____ Phone: _____

Fax: _____

Service(s) Provided: _____

ATTACHMENT E:
COUNTY OF CLARKE GENERAL TERMS AND CONDITIONS

These General Terms and Conditions are required for all sealed and unsealed written solicitations issued by the County of Clarke. The County of Clarke includes the Clarke County Board of Supervisors and General Government, the Clarke County School Board and School System, and all other agencies, boards, and commissions under the fiscal direction of the Clarke County Board of Supervisors.

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- A. **COMPETITION INTENDED:** It is Clarke County's intent that this document permits competition. It shall be the prospective bidder's responsibility to advise the Director of Joint Administrative Services in writing if any language requirements, specifications, etc., or any combinations thereof, inadvertently restrict or limit the requirements stated in this document to a single source. The Director of Joint Administrative Services must receive such notification not later than ten (10) calendar days prior to the date set for the bids to close.
- B. **INQUIRIES:** If any prospective bidder has questions about the specifications or other solicitation documents, the prospective bidder shall contact the Director of Joint Administrative Services, no later than seven (7) days before the due date.

Any changes after the bid is advertised will be official only when submitted in writing and signed by the Director of Joint Administrative Services.

Any and all changes will be made by addendum and sent to all recorded holders of the bid documents.

All addenda issued will become part of the bid.

For a list of specific persons available to discuss this bid, see Points of Contact.

- C. **INCONSISTENCY IN PROVISIONS:** In the event there are inconsistencies between the General Terms and Conditions and any other schedules contained herein, the first shall govern.
- D. **COOPERATIVE PURCHASING:** It is the desire of Clarke County that all other jurisdictions be allowed to "ride the bid" and enter in to a contract with any successful Contractor chosen by Clarke County, based on mutual agreement between successful Contractor(s) and other jurisdiction(s).

If this bid is used as a cooperative IFB issued by Clarke County, the following would apply:

1. Clarke County is acting as the "Contracting Agent" for the jurisdictions concerned and shall not be held liable for any costs, damages, etc., incurred by any other jurisdiction.
2. Each jurisdiction will execute its own purchase orders with the Contractor(s) and be invoiced accordingly, in accordance with each jurisdiction's purchasing policy and procedures.
3. For copies of other jurisdictions' terms and conditions, Contractor must contact them.

- E. **ETHICS IN PUBLIC CONTRACTING:** The provisions contained in Article 6 of the Virginia Public Procurement Act (VPPA) as set forth in the 1950 Code of Virginia, as amended, shall be applicable to all contracts solicited or entered in to by Clarke County. A copy of these provisions may be obtained from the Director of Joint Administrative Service upon request.

By submitting their bids, all bidders certify that their bids are made without collusion or fraud and that they have not offered or received any kickbacks or inducements from any other bidder, supplier, manufacturer or Subcontractor in connection with their bid, and that they have not conferred to any public employee having official responsibility for this procurement transaction any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised, unless consideration of substantially equal or greater value was exchanged.

The provisions referenced above supplement, but do not supersede, other provisions of law including, but not limited to, the Virginia Conflict of Interest Act (§2.2-3100 et. Seq.). The provisions apply notwithstanding the fact that the conduct described may not constitute a violation of the Virginia Conflict of Interests Act. To the extent that violations of the ethical standards of conduct constitute violations of the Code of Virginia, they shall be punishable as provided therein. Such sanctions shall be in addition to the civil remedies set forth.

By entering into a contract, the bidder conveys, sells, assigns, and transfers to Clarke County, all rights, title and interest in and to all causes of the action it may now have or hereafter acquire under the anti-trust laws of the United States and the Commonwealth of Virginia, relating to the particular goods or services purchased or acquired by Clarke County, under said contract.

Consistent and continued tie bidding could cause rejection of bids by Clarke County and/or investigation for anti-trust violations.

- F. **TAX-EXEMPT STATUS:** Since municipalities and school districts are exempt from all direct federal and state taxes, Clarke County is tax-exempt and will provide a tax-exempt certificate upon request.

- G. **APPLICABLE LAWS AND COURTS:** This solicitation and any resulting contract shall be governed by the laws of the Commonwealth of Virginia. All Court proceedings shall be held in the Commonwealth of Virginia. The contractor shall comply with all applicable federal, state and local laws, rules, ordinances, and regulations.

- H. **FIRM BID PRICING:** Clarke County requires the bid price remains firm for ninety (90) days after date of the bid opening, during which period bids may not be withdrawn. "Discount from list" bids are not acceptable unless requested.

- I. TIE BIDS: The Joint Administrative Services Department and all other departments of Clarke County making purchases of services, supplies, material or equipment, shall, in making purchases of same, give preference to services, supplies, material or equipment sold by Clarke County and the State of Virginia vendors, in that order, in all cases of tie bids, quality and service being equal.
- J. ANTI-DISCRIMINATION: Every individual or firm bidding must be an Equal Opportunity Employer as defined by federal law and the Code of Virginia, Virginia Public Procurement Act as amended: "Section 2.2-4311, Employment Discrimination by Contractor Prohibited" which reads:

All public bodies shall include in every contract of more than \$10,000 the following provisions:

1. During the performance of this contract, the contractor agrees as follows:
 - a. The contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, disability, or other basis prohibited by state law relating to discrimination in employment, except where there is a bona fide occupational qualification reasonably necessary to the normal operation of the contractor. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.
 - b. The contractor, in all solicitations or advertisements for employees placed by or on behalf of the contractor, will state that such contractor is an equal opportunity employer.
 - c. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.
 2. The contractor will include the provisions of the foregoing paragraphs a, b and c in every subcontract or purchase order of over \$10,000, so that the provisions will be binding upon each subcontractor or vendor.
- K. IMMIGRATION REFORM AND CONTROL ACT OF 1986: By submitting their bids, bidders certify that they do not and will not during the performance of this contract employ illegal alien workers or otherwise violate the provisions of the Federal Immigration Reform and Control Act of 1986.
- L. DEBARMENT STATUS: By submitting a bid, the bidder certifies that they are not currently debarred by the Federal Government, Commonwealth of Virginia, or by any City, Town, or County from submitting bids or proposals on contracts for the type of goods and/or services covered by this solicitation, nor are they an agent of any person or entity that is currently so debarred.
- M. RESPONSE FORM PROCEDURES:
1. Response Forms must be signed and received at the Purchasing Office, before the opening hour.
 2. Sealed Bids and Sealed Proposals offered by fax and or telephone will not be accepted.
 3. Quotes offered by fax will be accepted; however, telephone quotes will not be accepted.
 4. All Response Forms delivered in person must be delivered to the Purchasing Office.
 5. In submitting a Response Form, the bidder signifies that he/she is fully informed as to the extent and character of the supplies, materials, equipment and/or services necessary to perform this project in accordance with all documents constituting the bid and will comply satisfactorily with the bid documents.
 6. Further, the bidder signifies that when necessary he/she has inspected the site on which the work shall be done and is aware of all conditions affecting the execution of the work contained within the bid documents. Failure to visit the site will in no way relieve the successful bidder from performance under the contract.
 7. All information required by the solicitation must be supplied to constitute a responsive bid. All information submitted including prices should be typed so as to insure legibility. However, the bidder's signature shall be handwritten in ink in order for the bid to be considered.
 8. The bidder expressly warrants that the price or prices quoted herein are not the result of an agreement or understanding expressed or implied with any other bidder or bidders.
 9. By submitting a Response Form, bidders certify that they are not currently debarred by Clarke County from submitting bids, proposals or quotes on contracts, nor are they an agent of any person or entity that is currently debarred by Clarke County from submitting bids, proposals or quotes.

10. Any Response Form submitted with corrections must have corrections initialed by the person who signed the original. The unit price will prevail in the event an error is made in computing totals.
11. All prices for materials are to be F.O.B. Destination, prepaid and allowed. Except as otherwise specified herein, standard commercial packaging, packing and shipping containers shall be used. All shipping containers shall be legibly marked or labeled on the outside with purchase order, commodity description, and quantity.
12. The successful bidder shall not assign, transfer, convey, sublet, or otherwise dispose of the contract or his/her right, title, or interest therein, or his/her power to execute written consent of Clarke County.
13. Bidders are encouraged to have a representative at the bid opening if information on the bids submitted is desired.
14. Bids will be opened at the advertised local prevailing time, but Clarke County officials reserve the right to take sufficient time to study the various bids and then make the awards. Bids will be awarded as promptly as possible after the closing date.
15. Unless otherwise specified, Response Forms must be submitted in triplicate and will be received at:
Clarke County Purchasing Office
129 Ramsburg Lane
Berryville VA 22611
16. Sealed Bid envelopes must be clearly marked, with the IFB number and project name, on the outside, lower left corner as follows:

Sealed Bid – Do Not Open

IFB # _____
PROJECT NAME _____

17. **Sealed Bids will be received up to the advertised time and date at the Clarke County Purchasing Office and at the appointed time will be opened publicly and read allowed. The clock on the Purchasing Office's wall will be used to log the time each bid/proposal is received.**
18. **If more than one bid opening is held the same date, bids will be opened in succession as numbered and lettered (A, B, C, etc.).**
 - a. Late bids will not be accepted. Bids received in the mail will be returned to the bidder unopened (provided properly sealed and marked as indicated above). Failure to comply with conditions set forth herein may result in removal of bid (all/part) from consideration.
 - b. All contracts, unless otherwise specifically stated, shall provide materials/commodities in new, first class condition, fresh stock, latest model, design or pack. This shall include any containers suitable for shipment, usage and/or storage unless otherwise indicated within this document. Verbal agreements to the contrary will not be recognized.
 - c. Any items or parts of any equipment listed in this solicitation which are not fully described or are omitted from such specifications and which are clearly necessary for the completion of such equipment and its appurtenance shall be considered a part of such equipment although not directly specified or called for in the specifications.
 - d. By law, Clarke County will not receive any materials, products, or chemicals that may be hazardous to an employee's health, unless accompanied by a Material Safety Data Sheet (MSDS) when products and/or chemicals are received. **MSDS must be submitted to Clarke County in triplicate.**

N. BID WITHDRAWALS

1. A bidder, for contract other than for public construction, may request withdrawal of his/her bid before award, by submitting a written request to the Director of Joint Administrative Services.
2. After bid/proposal opening, corrections shall be permitted only to the extent that the vendor can show by clear and convincing evidence that a mistake of a nonjudgmental character was made, the nature of the mistake, and the price actually intended. After the opening, no changes in prices or other provisions of bids/proposals prejudicial to the interest of the County or fair competition shall be permitted. In lieu of bid correction, a low bidder/offeror alleging a material mistake of fact may be permitted to withdraw its bid/proposal if:
 - a. the mistake is clearly evident on the face of the bid/proposal document but the intended correct bid/proposal is not similarly evident; or

- b. the vendor submits evidence which clearly and convincingly demonstrates that a mistake was made. All decisions to permit the correction or withdrawal of bids, or to cancel awards or contracts based on bid mistakes, shall be supported by a written determination made by the Director of Joint Administrative Services.
3. If bid bonds were tendered with the bid, Clarke County may exercise its right of collection. No bid may be withdrawn under this paragraph when the result would be the awarding of the contract on another bid of the same bidder in which the ownership of the withdrawing bidders is more than five percent (5%).
4. If a bid is withdrawn under the authority of this paragraph, the lowest qualified remaining bid shall be deemed to be the low bid.
5. Except as otherwise provided by regulation, all decisions to permit the correction or withdrawal of bids, or to cancel awards or contracts based on bid mistakes shall be supported by a written determination made by the Director of Joint Administrative Services.
6. No bidder who is permitted to withdraw a bid shall, for compensation, supply any material or labor or to perform any subcontract or other work agreement for the person or firm to whom the contract is awarded or otherwise benefit, directly or indirectly, from the performance of the project for which the withdrawn bid was submitted.

O. AWARD SPECIFICS

1. Clarke County reserves the right to accept, reject and/or cancel all or any part of any Response Form, and to waive minor technicalities.
2. Awards will be made to the lowest responsive and responsible bidder(s), provided services and quality are considered to be equal to (or better than) that offered by other bidders, and the right is reserved to make the award to other than the lowest bidder when it is in the best interest of Clarke County. Further, Clarke County will be the sole judge as to conditions affecting such interest.
3. Clarke County may make such reasonable investigations as deemed proper and necessary to determine the ability of the bidder to perform the work and/or furnish the item(s), and the bidder shall furnish to Clarke County all such information and data for this purpose, as may be requested.
4. Clarke County reserves the right to inspect bidder's physical facilities before award to satisfy questions regarding the bidder's capabilities.
5. Clarke County further reserves the right to reject any bid, proposal or quote if the evidence submitted by, or investigations of, such bidder fails to satisfy Clarke County, that such bidder is properly qualified to carry out the obligations of the contract and to complete the work and/or furnish the item(s) contemplated therein.
6. Clarke County reserves the right to conduct any test/inspection it may deem advisable to assure supplies and services confirm to the specification.
7. A contract shall not be assignable by the Contractor, in whole or part, without the written consent of Clarke County.
8. Unless otherwise specified, the right is reserved to make award based on all work and/or items, or on any part of work/items, whichever is in the best interest of Clarke County.
9. The right is reserved to cancel any contract and reject deliveries of any products or materials not in accordance with the specifications. All returns or exchanges will be at the Contractor's expense. Clarke County shall be the sole and final judge.
10. The Contractor shall pay all sales, consumer, use and other similar taxes for work or portions thereof provided by the Contractor which are legally enacted at the time bids are received, whether or not yet effective.
11. The right is reserved to decide when a deviation from specifications is of sufficient consequence, when measured against the purpose for which the item will be purchased, to justify including it for consideration. Clarke County shall be the sole and final judge.
12. Should the delivery of any part of an order be delayed beyond time specified, or should any portion of the products delivered fail to comply with the specifications, Clarke County shall have the right to buy at market price for immediately delivery, and any excess cost of same over the price named herein is to be paid by the Contractor or deducted from any money due him/her thereafter.

13. If delay is foreseen, the Contractor shall give thirty (30) days prior written notice to the Director of Joint Administrative Services. Clarke County has the right to extend delivery date if reasons appear, in the sole discretion of Clarke County, to be valid. The Contractor must keep Clarke County advised at all times of status of order.
14. Default in promised delivery (without accepted reasons) or failure to meet specifications, authorizes the Joint Administrative Services Department to purchase supplies, equipment or services elsewhere and charge the full increase in cost and handling to the defaulting Contractor.
15. **The Joint Administrative Services Department will permit NO SUBSTITUTIONS OR CANCELLATIONS after award without written approval.**
16. When Clarke County notifies a bidder, in writing, of its acceptance of the bidder's price(s) of any goods or services, this notification will signify the effective date of the acceptance of this contract.
17. Cancellation of a contract for any reason may result in the removal of the successful bidder's name from the mailing list for future bidding. If the cancellation is for non-performance of the contract, such cancellation may be at the successful bidder's expense.
18. All guarantees and warranties required shall be furnished by the Contractor and shall be delivered to the Purchasing Office before final payment on the contract is made. Unless otherwise stated, the manufacturer's standard warranty applies.

P. JUSTIFICATION FOR TERMINATION

1. Clarke County may terminate this contract in whole or part whenever the Director of Joint Administrative Services shall determine that such a termination is in the best interest of Clarke County.
2. Any such termination shall be effected by delivery to the Contractor at least ten (10) business days prior to the termination of a written Notice of Termination specifying the extent to which performance shall be terminated and the date upon which such termination becomes effective.
3. An equitable adjustment in the contract price shall be made for completed service, but no amount shall be allowed for anticipated profit or unperformed services.
4. If any work or service hereunder is in progress, but not completed as of the date of termination, then this contract may be extended upon written approval by Clarke County until said work or service is completed and accepted.
5. Possible reasons for termination are:
 - a. Termination for Convenience – in the event this contract is terminated or cancelled upon request and for the convenience of Clarke County, without the required ten (10) days advance written notice, then Clarke County shall negotiate reasonable termination costs, if applicable.
 - b. Termination for Cause – termination by Clarke County for cause, default or negligence on the part of the Contractor shall be excluded from the foregoing provision; termination costs, if any, shall not apply. The ten (10) days advance notice requirement is waived in the event of Termination for Cause.
 - c. Termination Due to Unavailability of Funds in Succeeding Fiscal Years – when funds are not appropriated or otherwise made available to support continuation of performance in a subsequent fiscal year, the contract shall be cancelled and the Contractor shall be reimbursed for the reasonable value of any non-recurring costs incurred but not amortized in the price of the supplies or services delivered under the contract.

- Q. DRUG FREE WORKPLACE: Every individual or firm bidding must be an Equal Opportunity Employer as defined by federal law and the Code of Virginia, Virginia Public Procurement Act as amended: "Section 2.2-4312, Drug-free Workplace to be Maintained by Contractor; Required Contract Provisions" which reads:

All public bodies shall include in every contract over \$10,000 the following provisions:

During the performance of this contract, the contractor agrees to (i) provide a drug-free workplace for the contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontract or purchase order of over \$10,000, so that the provisions will be binding upon each subcontractor or vendor.

For the purposes of this section, "drug-free workplace" means a site for the performance of work done in connection with a specific contract awarded to a contractor in accordance with this chapter, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the contract.

R. **INSURANCE REQUIREMENTS:** By signing and submitting a bid or proposal under this solicitation, the bidder or offeror certifies that if awarded the contract, it will have the following insurance coverage at the time the contract is awarded. For construction contracts, if any subcontractors are involved, the subcontractor will have workers' compensation insurance in accordance with §2.2-4332 and 65.2-800 et seq. of the Code of Virginia. The bidder or offeror further certifies that the contractor and any subcontractors, at any tier, will maintain these insurance coverage during the entire term of the contract and that all insurance coverage will be provided by insurance companies authorized to sell insurance in Virginia by the Virginia State Corporation Commission.

1. Please note the below insurance requirements are guideline minimum amounts only, and, depending on the goods/services required, may be increased or decreased. **Any changes in insurance requirements will be referenced within this document, under Specific Reference to General Terms and Conditions.**
2. The successful bidder shall procure, maintain and provide proof of insurance coverage for injuries to persons and/or property damage as may arise from, or in conjunction with, the work performed on behalf of Clarke County by the bidder, his/her agents, representatives, employees or Subcontractors.
3. Actual proof of coverage as contained herein shall be submitted to Clarke County Purchasing Office within five (5) days after award has been made and before any work starts, services are provided, or goods are delivered.
4. The bidder shall maintain such coverage for the duration of the contract period for "occurrence" policies. "Claims made" policies must be in force, or that coverage purchased, for three (3) years after contract completion date.
5. The Certificate of Insurance shall be properly completed as follows:
 - a. It shall name "Clarke County, Virginia, its officers, officials, employees, volunteers and agents (as their interest may appear)" as "Certificate Holder".
 - b. It shall list "Clarke County, Virginia, its officers, officials, employees, volunteers and agents (as their interest may appear) added as an additional insured" under "Description of Operations/Locations/Vehicles/Exclusions Added by Endorsement/Special Provisions".
 - c. This provision may not apply to Professional Liability or Workers' Compensation/Employers' Liability.
6. The Certificate of Insurance shall be for a minimum of the following:
 - a. **Worker's Compensation- Statutory requirements and benefits.** Coverage is compulsory for employers of three or more employees, to include the employer. Contractors who fail to notify the County of Clarke of increases in the number of employees that change their workers' compensation requirements under the Code of Virginia during the course of the contract shall be in noncompliance with the contract.
 - b. **Employer's Liability - \$100,000**
 - c. **General Liability – per occurrence** **\$1,000,000.00**

This coverage shall be as broad as: Comprehensive General Liability endorsed to include Broad Form, Bodily Injury and Property Damage, Personal and Advertising Injury, and Commercial General Liability form including Products/completed Liability Operations.
 - d. **Automobile Liability – per occurrence** **\$1,000,000.00**

Coverage shall be sufficient to cover all vehicles owned, used or hired by the bidder, his/her agents, representatives, employees and/or Subcontractors.
 - e. **Product Liability** **\$1,000,000.00**

Refer to General Liability above.

f. **Professional Liability/Errors and Omissions Coverages are required when soliciting those services as follows:**

<u>Profession/Service</u>	<u>Limits</u>
Accounting	\$1,000,000 per occurrence, \$3,000,000 aggregate
Architecture	\$2,000,000 per occurrence, \$6,000,000 aggregate
Asbestos Design, Inspection or Abatement Contractors	\$1,000,000 per occurrence, \$3,000,000 aggregate
Health Care Practitioner (to include Dentists, Licensed Dental Hygienists, Optometrists, Registered or Licensed Practical Nurses, Pharmacists, Physicians, Podiatrists, Chiropractors, Physical Therapists, Physical Therapist Assistants, Clinical Psychologists, Clinical Social Workers, Professional Counselors, Hospitals, or Health Maintenance Organizations.)	\$2,000,000 per occurrence, \$3,000,000 aggregate
**(This complies with §8.01-581.15 of the Code of Virginia)	
Insurance/Risk Management	\$1,000,000 per occurrence, \$3,000,000 aggregate
Landscape/Architecture	\$1,000,000 per occurrence, \$1,000,000 aggregate
Legal	\$1,000,000 per occurrence, \$5,000,000 aggregate
Professional Engineer	\$2,000,000 per occurrence, \$6,000,000 aggregate
Surveying	\$1,000,000 per occurrence, \$1,000,000 aggregate

7. The Contractor's insurance company shall provide thirty (30) days written notice to Clarke County before any cancellation, suspension, or void of coverage, in whole or part, where such provision is reasonable.
8. **Contractor shall be responsible for making sure any/all Subcontractors each provide a Certificate of Insurance and meet all of Clarke County's insurance requirements.**
9. All deductibles or self-insured retention shall appear on the certificate(s) and shall be subject to approval by Clarke County. At the option of Clarke County, either the insurer shall reduce or eliminate such deductible or self-insured retention; or the bidder shall be required to obtain a bond guaranteeing payment of losses and related claims expenses.
10. Failure to comply with any reporting provisions of the policy(ies) shall not affect coverage provided to Clarke County, its officers/officials, agents, employees and volunteers.
11. The insurer shall agree to waive all rights of subrogation against Clarke County, its officers/officials, agents, employees and volunteers for any act, omission or condition of premises by which the parties may be held liable by reason of negligence.
12. The bidder shall furnish Clarke County with the Certificate(s) of Insurance including endorsements affecting coverage. The certificates are to be signed by a person authorized by the insurance company(ies) to bind coverage on its behalf. If executed by a broker, a notarized copy of authorization to bind or certify coverage must be attached.
13. All insurance shall be placed with insurers maintaining an **A.M. Best** rating of no less than **A: VII**. If **A.M. Best** rating is less than **A: VII**, approval must be received from the Director of Joint Administrative Services.
14. All coverage designated herein shall be as broad as the Insurance Services Office ((SO) forms filed for use with the Commonwealth of Virginia.

S. BOND REQUIREMENTS

1. **Any necessary bonds will be referenced within this document, under Specific Reference to General Terms and Conditions** and the requirements are outlined below.

- a. **Bid Bonds** – Each bidder shall accompany their bid with a bid bond or certified check in the amount of five percent (5%) of the amount bid. Such bond shall serve as liquidated damages and be forfeited in the event the successful bidder fails to enter into the contract.

If a bid bond is required and stated in an invitation for bid and a bidder submits a bid without a bid bond, the bidder will be considered non-responsive and shall be disqualified.

- b. **Performance and Payment Bonds** – The successful Contractor shall furnish both a performance and payment bond, each in the amount equal to one hundred percent (100%) of the contract as security for the faithful performance of this contract.
- c.) One or more surety companies authorized to do business in Virginia shall execute each of the bonds and the contractor shall select the surety company. Required bonds shall be payable to the County.

3. **Any other special bonding requirements will be listed under Specific Reference to General Terms and Conditions.**

4. All bonds shall be obtained at bidder's expense and shall be included in the bid price.

T. PERMITS AND LICENSES

1. Clarke County will attempt to make reference, within this document, to any necessary permits and licenses under Special Terms and Conditions. However, the contractor is ultimately responsible for ensuring that he/she has all the required permits and licenses.
2. For convenience purposes only, the following most commonly required permits and licenses are listed with their respective contact information.

Clarke County Building Permit
Per instructions from Building Department Office
Phone 540-955-5112

Clarke County Business License
Per instructions from Commissioner of the Revenue's Office
Phone 540-955-5108

Virginia State Contractor's License
Per VA Board for Contractors Statutes Title 54.1, Chapter 11
Phone 804-367-8500

Town of Berryville Since some of the county and school property is located within the limits of the Town of Berryville, Contractor is advised to check with the Town office to see what permits and licenses might be required for those projects. The Town Office phone number is 540-955-1099.

3. **Clarke County does not waive any fees involved** in securing Clarke County (or any other) permits. Any required permits and licenses are to be obtained at bidder's or Contractor's expense and to be included in the bid price.

4. All permit/license numbers must be indicated on or attached to the Response Form of this document.

U. PAYMENTS TO CONTRACTOR

1. Contractor warrants having clear title to all materials and supplies by submission of invoice being presented for payment.
2. All submitted invoices shall reflect the contract number and/or purchase order number, a detailed itemized breakdown of all charges, and (unless otherwise specified) shall be delivered to:

Clarke County Accounts Payable
524 Westwood Road
Berryville VA 22611

(v) 540-955-6171 (f) 540-955-0676

- a. All submitted invoices shall show payer identification as follows:
- b. Individual Contractors shall provide social security number.
- c. Proprietorships, Partnerships and/or Corporations shall provide their federal employer identification number.
- d. Payment will be made thirty (30) days after receipt of proper invoice, or thirty (30) days after receipt of all goods or inspection and acceptance of work, whichever is later.
- e. Payment shall not preclude Clarke County from making a claim for adjustment on any item later found not to have been in accordance with the contract.
- f. Unreasonable Charges. Under certain emergency procurements and for most time and material purchases, final job costs cannot be accurately determined at the time orders are placed. In such cases, contractors should be put on notice that final payment in full is contingent on a determination of reasonableness with respect to all invoiced charges. Charges that appear to be unreasonable will be researched and challenged, and that portion of the invoice held in abeyance until a settlement can be reached. Upon determining that invoiced charges are not reasonable, the County of Clarke shall promptly notify the contractor as to those charges that it considers unreasonable and the basis for the determination. A contractor may not institute legal action unless a settlement cannot be reached within thirty (30) days of notification.

V. PAYMENTS TO SUBCONTRACTORS

- 1. Any mention of the term "subcontractor(s)" in this section shall include any and all sub-tier Contractors.
- 2. A Contractor awarded the contract under this solicitation is hereby obligated to:
 - a. Pay the Subcontractor(s) within seven (7) days of the Contractor's receipt of payment from Clarke County for the proportionate share of payment received for work performed by the Subcontractor(s) under the contract or to notify Clarke County and the Subcontractor(s), in writing of the Contractor's intention to withhold payment and the reason.
 - b. Pay the Subcontractor(s) interest at the rate of one percent (1%) per month (unless otherwise provided under the terms of the contract) on all amounts owed by the Contractor that remain unpaid seven (7) days following receipt of payment from Clarke county, except for amounts withheld as stated above.
 - c. The date of mailing of any payment by U. S. mail is deemed to be payment to the addressee.
 - d. A Contractor's obligation to pay an interest charge to a Subcontractor may not be construed to be an obligation on the part of Clarke County.
 - e. By submitting an invoice, the contractor agrees that all subcontractors have been paid or will be paid and the Contractor shall be responsible for resolving any and all claims submitted by the subcontractors.

W. DISPUTES

- 1. Contractual claims, whether for money or other relief, shall be submitted in writing no later than sixty (60) calendar days after final payment; however, written notice of the Contractor's intention to file such claim shall have been given at the time of the occurrence or beginning of the work upon which the claim is based.
- 2. Nothing herein shall preclude a contract from requiring submission of an invoice for final payment within a certain time after completion and acceptance of the work or acceptance of the goods. Pendency of claims shall not delay payment of amount agreed due in the final payment.

X. PROTEST OF AWARD OR DECISION TO AWARD

- 1. Any bidder or offeror who desires to protest the award or decision to award a contract shall submit such protest, in writing, to the Director of Joint Administrative Services, no later than ten (10) calendar days after the award announcement or decision to award, whichever occurs first.

2. No protest shall lie for a claim that the selected bidder or offeror is not a responsible bidder or offeror.
3. Written protest shall include basis for the protest and relief sought.

Y. USE OF BRAND NAMES

1. Unless otherwise provided within this document, the name of a certain brand, make or manufacturer does not restrict bidders to the specific brand, make or manufacturer names; it conveys the general style, type, character, and/or quality of the article desired, and any article which Clarke county in its sole discretion determines to be the equal of that specified, considering quality, workmanship, economy of operation, and suitability for the purpose intended, shall be accepted.
2. Any catalog, brand name or manufacturer's reference used in the bid invitation is descriptive – **not restrictive** – it is to indicate the type and quality desired.
3. Bids on brands of like nature and quality will be considered.
4. If other than brand specified is offered, illustrations and complete description (manufacturer, brand or trade name, catalog number, etc.) must be submitted with bid. Please note that samples may be required.
5. If bidder makes no other bid and takes no exception to the specifications or reference data, the bidder will be required to furnish brand names, numbers, etc., as specified.
6. Bidders, by their signature and submission of bid, certify that any/all item(s) bid upon meet and/or exceed the specifications.

Z. PAYMENT OF CLARKE COUNTY TAXES

1. All bidders located or owning property in Clarke County shall assure that all **real and personal property taxes are paid before submitting a bid.**
2. Clarke County will verify payment of all real and personal property taxes by the successful bidder before the award of any contract.

AA. NOTICE OF REQUIRED DISABILITY LEGISLATION COMPLIANCE

1. Clarke County is required to comply with state and federal disability legislation: §504 of The Rehabilitation Act (RA) of 1973, The Americans with Disabilities Act (ADA) for 1990 Title II, and the Virginians with Disabilities Act (VDA) of 1990.
2. Specifically, Clarke County may not, through its contractual and/or financial arrangements, directly or indirectly, avoid compliance with Title II of the ADA, Public Law 101-336, which prohibits discrimination on the basis of disability by public entities.
3. Subtitle A protects qualified individuals with disability from services, programs, or activities of all state and local governments. It extends the prohibition of discrimination in federally assisted programs established by the RA of 1973 Section 504 to all activities of state and local governments, including those that do not receive federal financial assistance, and incorporates specific prohibitions of discrimination on the basis of disability in Titles I, III, and V of the ADA. The VDA of 1990 follows the RA of 1973, Section 504.

BB. CONTRACT QUANTITIES

1. The quantities specified in this document are estimated only, and are given for the information of bidders and not for the purpose of bid evaluation. They do not indicate the actual quantity to be ordered, since such volume will depend upon requirements that develop during the contract period.
2. Quantities shown shall not be construed to represent any amount which Clarke County shall be obligated to purchase under the contract, or relieve the Contractor of obligation to fill all orders placed by Clarke County.
3. No bid will be considered which stipulates that Clarke County shall guarantee to order a specific quantity of any item.

- CC. DEVIATIONS: If there is any deviation in any bid from that prescribed in the Scope of Services, the appropriate line in the Scope of Work/Services shall be ruled out and the substitution clearly indicated and submitted with the Bid Response Form. Clarke County reserves the right to determine the responsiveness of any deviation(s).
- DD. SAFETY
1. All Contractors and Subcontractors performing services for Clarke County are required to and shall comply with all Occupational Safety and Health Administration (OSHA), state and county Safety and Occupational Health Standards and any other applicable rules and regulations.
 2. Also, all Contractors and Subcontractors shall be held responsible for the safety of their employees and any unsafe acts or conditions that may cause injury or damage to any persons or property within and around the work site area under this contract.
- EE. HOLD HARMLESS CLAUSE: Bidders shall provide that, during the term of this contract, including any warranty period, for the firm indemnifying, defending and holding harmless of Clarke County, its officials, employees, agents, representatives thereof, from all suits, actions or claims of any kind, including attorney's fees, brought on account of any personal injuries, damages or violations of rights, sustained by any person or property in consequence of any neglect in safeguarding contract work or on account of any act or omission by the Contractor or Contractor's employees, or from any claims or amounts arising from violation of any law, bylaw, ordinance, regulation or decree. The bidder also agrees that this clause shall include claims involving infringement of patent or copyright.
- FF. REFERENCES: All bidders shall include with their Response Form a list of current references for whom comparable work has been performed or to whom comparable goods have been provided. A separate attachment has been provided and must be completed entirely and returned with the bid. Failure to include Reference Form may be ample cause for rejection of bid as non-responsive.
- GG. FEDERAL/STATE LAWS AND COUNTY ORDINANCES: Any and all Federal and Commonwealth of Virginia Laws and County Ordinances that are not referenced or stated in the County's General Terms and Conditions shall apply to all contracts/orders.
- HH. ANTITRUST: By entering into a contract, the contractor conveys, sells, assigns, and transfers to the County of Clarke all rights, title and interest in and to all causes of action it may now have or hereafter acquire under the antitrust laws of the United States and the Commonwealth of Virginia, relating to the particular goods or services purchases or acquired by the County of Clarke under said contract.
- II. DEFAULT: In case of failure to deliver goods or services in accordance with the contract terms and conditions, the County of Clarke, after due oral or written notice, may procure them from other sources and hold the contractor responsible for any resulting additional purchase and administrative costs. This remedy shall be in addition to any other remedies that the County may have.
- JJ. TYPES OF CONTRACT CLAUSES THAT THE COUNTY SHALL ATTEMPT TO REMOVE FROM VENDOR CONTRACTS. Some, but not all, examples of clauses that may delay or stop a contract from being signed are shown below:
- a. The County shall attempt to remove late fee clauses.
 - b. The County shall attempt to remove one-time fee clauses, such as administrative, restocking, and documentation fees.
 - c. The County shall attempt to remove clauses involving the adjustment of payments due on a fixed-price contract (without prior County approval).
 - d. The County shall attempt to remove clauses that provide the vendor with an automatic renewal of a contract unless County notification is provided within a particular time frame.
 - e. The County shall attempt to remove clauses where the County is asked to reimburse a vendor for its expenses to refurbish equipment or materials that have been leased by the County to ensure that the vendor can resell or release the item.
 - f. The County shall attempt to remove clauses where the County is asked to provide a security deposit.

- g. The County shall attempt to remove any clauses that disclaim warranties.
- h. The County shall attempt to remove any clauses that put time constraints on the County's right to file legal action.
- i. The County shall attempt to remove indemnity clauses from all contracts. If the complete removal of an indemnity clause can not be agreed upon, the County shall ensure that the maximum amount of liability is satisfactory. The County also may attempt to include its own indemnity clause in which the County's maximum amount of liability is clearly stated.
- j. The Clarke County Treasurer must approve any contract that allows a vendor to directly debit/charge the County's bank account.
- k. All Court proceedings shall be held in the Commonwealth of Virginia.

When a specific contract clause can not be agreed upon, the County reserves the right to end negotiations with the respective vendor and begin negotiations with another vendor.

KK. SEVERABILITY OF CONTRACT: In the event that any provision shall be adjudged or decreed to be invalid, such ruling shall not invalidate the entire Agreement but shall pertain only to the provision in question and the remaining provisions shall continue to be valid, binding and in full force and effect.

LL. The County reserves the right to waive or amend any of its General Terms and Conditions if the Purchasing Agent and/or Joint Administrative Board deem it to be in the best interest of the County.

END OF GENERAL TERMS AND CONDITIONS
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